CLE1

DESCRIPCIÓN

Sistema de pago y de realización de transacciones bancarias.

Objeto de la invención.

La presente invención se refiere a un sistema de pago y de realización de transacciones bancarias, del tipo de los que comprenden unos terminales dotados de, al menos, unos medios de identificación del usuario y unos medios de comunicación, local o global, con redes telemáticas. En este sistema de pago, dichos terminales son conectados a través de dichas redes telemáticas con servidores de bases de datos de entidades bancarias o financieras para efectuar pagos y transacciones bancarias, de forma segura, cómoda y fiable, utilizando las huellas dactilares del propio usuario como elemento identificador único y singular.

Campo de aplicación de la invención.

La presente invención es aplicable en el sector del comercio, la banca y de los medios de pago en general.

Antecedentes de la invención.

En la actualidad existe una gran variedad de medios de pago, para la realización de transacciones comerciales y bancarias, que van desde el dinero en metálico, los cheques y pagarés, o las tarjetas de crédito o débito.

Principalmente, los sistemas de pago con tarjetas se han extendido por su bajo coste y la facilidad de obtener dinero en cualquier cajero automático o poder realizar compras y utilizar servicios en establecimientos diversos, sin que los usuarios deban estar pendientes de llevar dinero en metálico.

Así, un sistema de pago que utiliza una tarjeta de crédito o débito convencional comprende unos terminales dotados de un microprocesador asociado a una interfaz de usuario, unos medios de comunicación externa, local o global, con redes telemáticas y de unos medios de identificación del usuario, que en este caso es un lector de tarjetas correspondiente. Dichos terminales son conectables a través de redes telemáticas con servidores de bases de datos de entidades bancarias o financieras. En estas bases de datos figuran los datos de los usuarios, la identificación única de cada tarjeta y las cuentas asociadas con dichas tarjetas. De esta forma se facilita al usuario el uso del dinero depositado en dichas cuentas o del crédito que dispone identificándose con las citadas tarjetas.

Sin embargo, el uso de estas tarjetas plantea diversos problemas, ya que son susceptibles de robo, y el ladrón las puede utilizar sin el control del usuario, comprando objetos sin permiso o sacando dinero de las cuentas bancarias asociadas. Esto se debe a que las tarjetas de crédito no evitan que las pueda usar otra persona que no sea el usuario.

Estas tarjetas están conformadas principalmente por un cuerpo laminar de plástico que presenta fijada una banda magnética codificada, legible mediante un terminal adecuado, que comprende como medio de identificación del usuario un lector de dicha banda magnética de la tarjeta.

Actualmente la banda magnética de la tarjeta es fácilmente copiable por un ladrón o malhechor duplicando la tarjeta.

En otro caso, la tarjeta comprende un chip integrado. Una vez insertada la tarjeta en el terminal adecuado, el chip es legible, al establecer conexión con unos contactos que posibilitan su lectura, para poder establecer una transacción bancaria electrónica, mediante el uso de algoritmos y códigos alojados en dicho chip. Estas tarjetas son más difíciles de copiar, pero se pueden dañar fácilmente, resultando inoperantes.

En ciertas situaciones el usuario puede tener un problema consistente en cómo llevar una tarjeta que puede utilizar para un uso imprevisto. Por ejemplo, un usuario de vacaciones en la playa lleva lo imprescindible, y las tarjetas de crédito no se pueden llevar porque son difíciles de guardar, susceptibles al robo, de que se estropeen por la arena, el agua o el calor, y la posibilidad considerable de perderlas.

Este problema del transporte y custodia de las tarjetas se agudiza porque si el usuario tiene varias cuentas bancarias, necesita una tarjeta independiente para cada una de ellas, multiplicándose el número de tarjetas a transportar en la cartera.

El solicitante de la presente invención desconoce la existencia de antecedentes que resuelvan de forma satisfactoria la problemática expuesta.

Descripción de la invención.

El sistema de pago y de realización de transacciones bancarias, objeto de esta invención, presenta unas particularidades técnicas que permiten a los usuarios disponer de dinero o poder hacer compras en cualquier lugar de forma segura, siendo su propia huella dactilar el medio de reconocimiento seguro, fiable y personal.

El sistema es del tipo de los que comprenden unos terminales dotados de un microprocesador asociado a una interfaz de usuario, unos medios de comunicación externa, local o global, con redes telemáticas y de unos medios de identificación del usuario. Dichos terminales son conectables a través de redes telemáticas con servidores de bases de datos de entidades bancarias o financieras para la realización de los pagos o transacciones bancarias.

De acuerdo con la invención los medios de identificación del usuario comprenden un lector de huellas dactilares para la identificación única y singular del usuario por la lectura biométrica de la huella dactilar de al menos uno de sus dedos.

De esta forma se libera al usuario de tener que llevar una tarjeta o cualquier elemento como título de identificación, que es susceptible de ser perdido o robado y utilizado por otra persona. La huella dactilar de un usuario es única y característica, siendo fácilmente digitalizable por el lector de huellas dactilares. En las bases de datos de los servidores de las entidades bancarias se encuentran almacenadas las huellas dactilares de los usuarios y las cuentas bancarias que cada usuario tiene asociadas para que pueda escoger en cual se realiza el cargo. Para mejorar la seguridad, en las bases de datos se almacena un número personal o PIN a cada usuario y que permite la validación de la operación.

Además el usuario puede conectar varias cuentas bancarias a su huella, de forma que a la hora de realizar una operación puede escoger con que cuenta efectúa el pago o transacción, en vez de disponer diversas tarjetas independientes para las distintas cuentas bancarias.

En una primera realización, un terminal autónomo presenta alojados en una carcasa portátil el lector de una o varias huellas dactilares, el microprocesador, los medios de comunicación con redes telemáticas y la interfaz de usuario. Estos terminales autónomos de tamaño compacto son ideales para su uso en establecimientos comerciales, pudiendo funcionar alimentados a baterías o por conexión directa a la red de suministro.

Los medios de comunicación con las redes telemáticas pueden ser diversos, siendo dichos medios de comunicación preferentemente inalámbricos, tales como una conexión wifi, que facilita la movilidad y manejo del terminal.

En una realización el terminal autónomo comprende una memoria conectada con el microprocesador, de almacenamiento de comprobantes bancarios informáticos emitidos por los servidores de las entidades bancarias o financieras. Asimismo, el terminal autónomo también comprende un puerto de conexión directa con un ordenador. De esta forma el dueño o encargado del establecimiento puede descargar en un ordenador los comprobantes bancarios informáticos para llevar a cabo la contabilidad del establecimiento.

En una realización preferente la interfaz de usuario comprende una pantalla y un teclado. En esta pantalla, tanto el usuario como el dependiente que opera el terminal, obtienen información del funcionamiento del terminal. El teclado posibilita el manejo del terminal autónomo, posibilitando la entrada de comandos usuales por botones dedicados, la introducción del número personal del usuario, la selección de las cuentas disponibles o la configuración del terminal autónomo.

En una alternativa de realización la interfaz de usuario puede ser una pantalla táctil con un teclado virtual, integrado en el terminal autónomo.

Se ha previsto que un mismo terminal autónomo funcione como terminal de pago en un establecimiento comercial, y como terminal de solicitud de alta en el sistema por parte de un usuario, adquisición de la huella o huellas dactilares para las bases de datos de los servidores, y configuración de cuentas en una entidad bancaria. Esta última opción posibilita a un usuario contratar el servicio de pago con este sistema en el momento, ya que se evita la operación de fabricar la tarjeta personalizada.

En una segunda realización el terminal presenta el lector de huellas dactilares, y unos medios de conexión local alojados en una carcasa de protección, conectable con un ordenador o teléfono móvil, comprendiendo estos últimos: el microprocesador, la interfaz de usuario y los medios de comunicación con redes telemáticas. Los medios de conexión local pueden ser de diversa índole, tal como un puerto USB, un módulo Bluetooth o cualquier otro que permita transferir la huella dactilar digitalizada al microprocesador para la ejecución del software adecuado de funcionamiento como terminal.

Así es posible comprender en un dispositivo una versión reducida y simplificada, que una vez conectada a un ordenador lo configura como terminal con todos los elementos necesarios. Esta configuración del terminal es adecuada para que un usuario pueda realizar compras por Internet de una manera totalmente segura y equivalente a una compra con pago mediante un terminal de la invención completo. En unos ejemplos, los medios de comunicación local pueden ser un puerto USB, o un módulo wifi o bluetooth. El coste de este dispositivo es mucho más reducido que el coste de un terminal completo, haciéndolo idóneo para el uso personal y doméstico.

En otra realización, el terminal está conformado en un cajero automático, incorporando el lector de huellas dactilares al hardware ya existente del cajero, e incorporando una pequeña parte de software que posibilita su

manejo de forma integrada.

El sistema puede ofrecer servicios añadidos, tal como emitir automáticamente una factura informática que se envía por correo electrónico al usuario, si éste ha facilitado los datos de identificación fiscal y una dirección de correo electrónico de destino de dichas facturas en el momento de darse de alta en el sistema.

Descripción de las figuras.

Para complementar la descripción que se está realizando y con objeto de facilitar la comprensión de las características de la invención, se acompaña a la presente memoria descriptiva un juego de dibujos en los que, con carácter ilustrativo y no limitativo, se ha representado lo siguiente:

- La figura 1 muestra un esquema de bloques de los componentes de un terminal válido en el sistema.

- La figura 2 muestra un esquema del sistema donde se observan distintas configuraciones de los terminales, como terminal autónomo autónomo, cajero automático, o terminal doméstico conformado por un ordenador doméstico y un dispositivo de lectura de huellas dactilares.

Realización preferente de la invención

Como se puede observar en las figuras referenciadas el sistema comprende unos terminales (1a) autónomos dotados de un microprocesador (11) asociado a una interfaz de usuario, unos medios de comunicación (12) externa, con redes telemáticas (2) y de unos medios de identificación del usuario, que en este caso están conformados por un lector de huellas dactilares (13). Este terminal (1a) autónomo es conectable a través de las redes telemáticas (2) con servidores (3) de bases de datos de entidades bancarias o financieras en las que están almacenados los datos de los usuarios, sus cuentas bancarias conectadas al sistema, las huellas dactilares digitalizadas que dan acceso a los servicios, los números secretos de validación que posibilitan las operaciones de pago y de realización de transacciones bancarias entre otros datos.

En una realización apta para su uso en un establecimiento comercial o de servicios, o en una oficina de una entidad bancaria, el terminal (1a) autónomo está incorporado en una carcasa portátil que presenta integrados: el lector de huellas dactilares (13), el microprocesador (11), los medios de comunicación (12) con las redes telemáticas (2) y el interfaz del usuario. En este caso, la interfaz de usuario comprende una pantalla (14) de visualización de datos y un teclado (15) para la manipulación del terminal (1a) autónomo, introducción del importe a cobrar, de los comandos de funcionamiento y del número secreto de validación. Los medios de comunicación (12) con las redes telemáticas (2) están conformados por un puerto de conexión telefónica o ADSL, y un módulo wifi inalámbrico.

En una realización, el terminal autónomo (1a) presenta una memoria (16) asociada al microprocesador para el almacenamiento de los comprobantes bancarios informáticos emitidos por los servidores (3) de las entidades bancarias y financieras tras cada operación realizada. Asimismo, el terminal autónomo (1a) autónomo presenta un puerto de conexión directa (17) a ordenador para la descarga del contenido de dicha memoria (16).

En otra realización, que se puede observar en la figura 2, un terminal doméstico (1b) presenta el lector de huellas dactilares (13) y unos medios de conexión local (18), en este caso un puerto USB, alojados en una carcasa de protección, conectables con un ordenador (4), el cual proporciona el resto de los componentes, posibilitando la conversión de dicho ordenador (4) o teléfono móvil en un terminal de pago en compras por Internet.

En otra realización, el terminal (1c) está incorporado en un cajero automático para su acceso y funcionamiento mediante la huella dactilar.

Una vez descrita suficientemente la naturaleza de la invención, así como un ejemplo de realización preferente, se hace constar a los efectos oportunos que los materiales, forma, tamaño y disposición de los elementos descritos podrán ser modificados, siempre y cuando ello no suponga una alteración de las características esenciales de la invención que se reivindican a continuación.

REIVINDICACIONES

1.- Sistema de pago y de realización de transacciones bancarias, del tipo de los que comprenden unos terminales (1a, 1b, 1c) dotados de un microprocesador (11) asociado a una interfaz de usuario, unos medios de comunicación (12) externa, local o global, con redes telemáticas (2) y de unos medios de identificación del usuario; siendo dichos terminales (1a, 1b, 1c) conectables a través de redes telemáticas (2) con servidores (3) de bases de datos de entidades bancarias o financieras, **caracterizado** porque los medios de identificación del usuario comprenden un lector de huellas dactilares (13) para la identificación única y singular del usuario por la lectura biométrica de al menos uno de sus dedos.

2.- Sistema, según la reivindicación 1, **caracterizado** porque un terminal (1a) autónomo presenta una carcasa portátil en la que se encuentran alojados el lector de huellas dactilares (13), el microprocesador (11), los medios de comunicación (12) con redes telemáticas (2) y la interfaz de usuario.

3.- Sistema, según cualquiera de las reivindicaciones anteriores, **caracterizado** porque los medios de comunicación (12) son inalámbricos.

4.- Sistema, según la reivindicación 2, **caracterizado** porque el terminal (1a) autónomo comprende una memoria (16) conectada con el microprocesador (11) de almacenamiento de comprobantes bancarios informáticos, emitidos por los servidores (3) de las entidades bancarias o financieras.

5.- Sistema, según cualquiera de las reivindicaciones anteriores, **caracterizado** porque el terminal (1a) autónomo comprende un puerto de conexión directa (17) con un ordenador.

6.- Sistema, según cualquiera de las reivindicaciones anteriores, **caracterizado** porque la interfaz de usuario comprende una pantalla (14) y un teclado (15).

7.- Sistema, según la reivindicación 1, **caracterizado** porque el terminal doméstico (1b) presenta el lector de huellas dactilares (13) y unos medios de conexión local (18) alojados en una carcasa de protección, conectable con un ordenador (4) o teléfono móvil, el cual comprende el microprocesador (11), la interfaz de usuario y los medios de comunicación (12) con redes telemáticas (2).

8.- Sistema, según la reivindicación 1, **caracterizado** porque el terminal (1c) está conformado en un cajero automático.

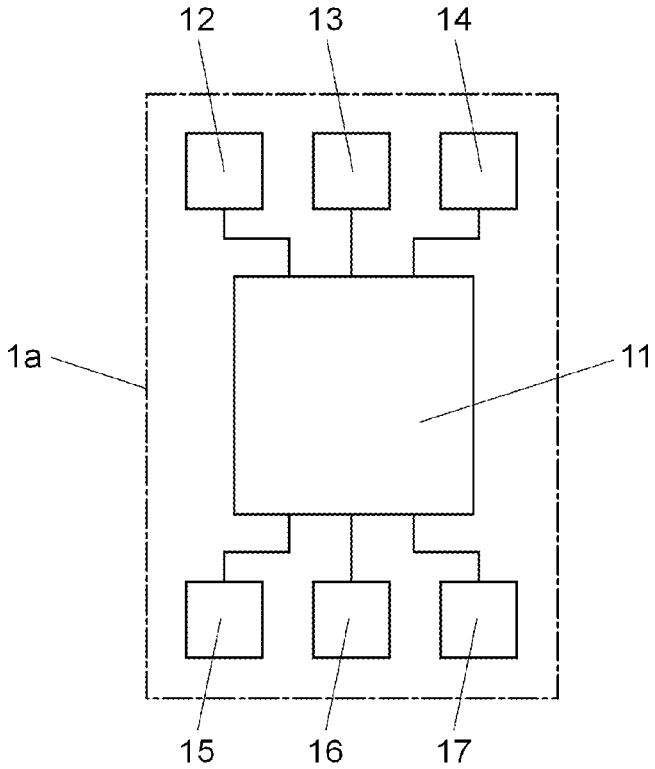


Fig. 1

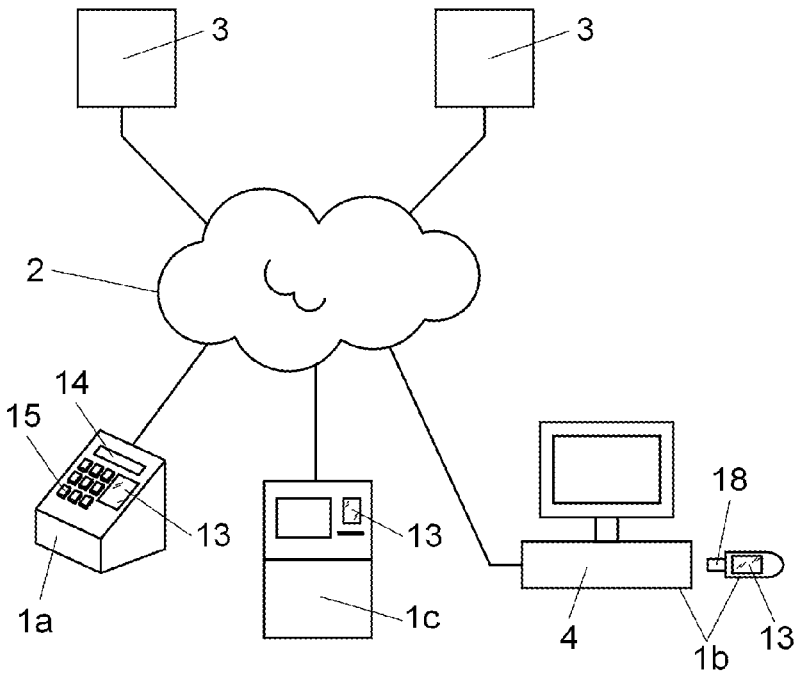


Fig. 2

CLE2

DESCRIPCIÓN

Cargador solar para dispositivos móviles.

Sector técnico de la invención

La presente invención se refiere a un cargador solar que permite recargarla batería de dispositivos móviles, como son teléfonos móviles, tabletas, etc, a partir de la energía solar.

Antecedentes de la invención

Son conocidos en el estado de la técnica diferentes tipos de cargadores de dispositivos móviles, principalmente basados en el uso de la energía eléctrica o incluso cargadores solares portátiles de pequeño tamaño. Tal es, por ejemplo, el dispositivo divulgado en el documento ES2253092A1, que describe un cargador solar portátil para recargar un teléfono móvil y que, por tanto debe llevar el usuario para poder utilizarlo.

Sin embargo, no se conoce en el estado de la técnica ningún cargador solar para dispositivos móviles configurado para instalarse en un lugar público de modo que los usuarios puedan utilizarlo siempre que lo necesiten sin tener que llevarlo consigo.

La necesidad de recargar cualquier dispositivo móvil en lugares donde no se dispone de enchufe a la red eléctrica es uno de los inconvenientes más comunes con los que se encuentran los usuarios de dispositivos móviles tales como teléfonos móviles o tabletas.

Así pues, la presente invención describe un cargador solar con idea de cubrir esta demanda social, que se hace cada vez más necesaria y de la que aun no se ha encontrado solución que cubra la totalidad de las necesidades de usuarios y, especialmente, de aquéllos que se encuentran con la necesidad de recargar la batería de su dispositivo móvil en lugares públicos como calles, plazas, paradas de autobús, incluso en bares y cafeterías con terraza.

Descripción de la invención

El cargador solar de la presente invención es un dispositivo autónomo, alimentado exclusivamente por energía solar y dedicado a la recarga de dispositivos móviles tales como teléfonos móviles y tabletas entre otros.

El cargador solar de la presente invención consta de una columna de sujeción en cuya parte superior se dispone un panel solar fotovoltaico, que se encuentra anclado a dicha columna mediante un soporte. Preferiblemente la columna de sujeción tiene una forma troncocónica o cilíndrica.

El panel solar fotovoltaico está conectado a una batería. Preferiblemente ésta se encuentra situada dentro de un armario antivandálico para mayor protección.

Conectado tanto a la batería como al panel solar fotovoltaico se encuentra un controlador de carga. Preferiblemente se trata de un controlador de seguimiento de punto de máxima potencia (MPPT, por sus siglas en inglés, *Maximum Power point Tracking*).

Además, el cargador solar comprende al menos un módulo de conexión a un dispositivo móvil como, por ejemplo, un módulo hembra de entrada USB accesible a los usuarios de manera que éstos puedan conectar su dispositivo móvil cuando tengan la necesidad de recargar el mismo. Este módulo de conexión está conectado al controlador de carga mediante cables.

Preferiblemente, el cargador comprende varios módulos hembra USB de forma que se permite una recarga de múltiples dispositivos.

El cargador solar comprende asimismo unos medios se sujeción al suelo configurados para mantener el cargador solar fijado al suelo. Estos medios pueden ser unos pernos de acero en dado de hormigón para mantener la columna de sujeción fijada al suelo.

Preferiblemente, el cargador solar comprende al menos una plataforma circular unida a la columna de sujeción configurada como soporte de los dispositivos móviles durante el tiempo de recarga.

Preferiblemente, el cargador solar incluye una plataforma circular de protección unida a la columna de sujeción cuya funcionalidad es proteger a los módulos USB de los rigores de la intemperie. Esta plataforma, por tanto, se encuentra situada por encima de los módulos hembra USB.

El cargador solar se completa opcionalmente con al menos un asiento unido a la columna de sujeción configurado para que los usuarios puedan sentarse durante el tiempo de recarga de su dispositivo móvil. Preferiblemente comprende varios asientos para poder dar servicio a un mayor número de usuarios.

Otro elemento opcional del cargador solar descrito en la presente invención es un disco circular que actúa como parasol o paraguas para proteger a los usuarios que estén cargando sus dispositivos móviles. Este disco solar se encuentra situado en la parte superior de la columna de sujeción, por debajo del panel solar fotovoltaico.

El cargador solar para dispositivos móviles aquí descrito se concibe como un elemento de mobiliario urbano diseñado para integrarse en cualquier entorno (calle, plaza, terraza, parque, etc.), dando a los ciudadanos un servicio, con la posibilidad de recargar sus dispositivos mientras están en zonas donde no disponen de sus cargadores de dispositivos.

Descripción de las figuras

Para completar la descripción que se está realizando y con objeto de ayudar a una mayor comprensión de la invención, se acompaña una figura donde con carácter ilustrativo y no limitativo se ha representado lo siguiente:

Figura 1: muestra un esquema del cargador solar para dispositivos móviles de la presente invención.

En dicha figura, las diferentes referencias que en ella aparecen tienen los siguientes significados:

1.- Columna de sujeción

2.- Panel solar fotovoltaico

3.- Batería

4.- Módulo de conexión a un dispositivo móvil

5.- Controlador de carga

6.- Plataforma circular de soporte

7.- Plataforma circular de protección de módulos USB

8.- Asiento

9.- Disco circular

Descripción detallada de la invención

A continuación se describe de forma detallada el cargador solar para dispositivos móviles de la presente invención en base a la figura presentada. El cargador consta de una columna de sujeción (1) cilíndrica de tres metros de altura. En su parte superior se aloja un panel solar fotovoltaico (2) de 80W de potencia de dimensiones 1150x535x35mm anclado mediante un soporte a la columna de sujeción (1). El panel solar fotovoltaico (2) está conectado a una batería (3) de 12V y 18Ah, que, a su vez, se encuentra dentro de un armario antivandálico. Conectado tanto a la batería (3) como al panel solar fotovoltaico (2) existe un controlador de carga MPPT (5) para regular la carga de la batería convirtiendo la corriente eléctrica de 12V a 5V. Este controlador de carga (5) se encuentra ubicado en el interior de la columna de sujeción (1).

Conectados al controlador de carga MPPT (5) se encuentran cuatro módulos de conexión (4), siendo módulos hembra USB estándar alimentados a 5V. Estos módulos hembra USB (4) están accesibles a los usuarios para que éstos puedan conectar sus dispositivos móviles.

El anclaje del cargador solar al suelo se realiza mediante unos medios de anclaje al suelo (no representados) consistentes en unos pernos de acero, preferiblemente de18x500mm, en dado de hormigón.

El cargador incluye una plataforma circular de soporte (6) unida a la columna de sujeción (1), estando dicha plataforma configurada para la sujeción de los dispositivos móviles a recargar.

El cargador solar también incluye una plataforma circular de protección de módulos USB (7) unida a la columna de sujeción (1) y configurada para la protección de los módulos hembra USB (4). Se encuentra, por tanto, situada por encima de dichos módulos (4).

En esta realización particular, el cargador solar incluye tres asientos (8) unidos a la columna de sujeción dispuestos para dar confort a los usuarios durante el tiempo de recarga de sus dispositivos móviles.

Finalmente, el cargador solar incluye un disco circular (9) a modo de parasol o paraguas situado en la parte superior de la columna de sujeción (1) por debajo del panel solar fotovoltaico (2) para proteger a los usuarios del sol o lluvia mientras recargan su dispositivo móvil.

REIVINDICACIONES

1. Cargador solar para dispositivos móviles **caracterizado** por comprender:

- una columna de sujeción (1),

- un panel solar fotovoltaico (2) alojado en la parte superior de la columna de sujeción (1) y anclado a la misma mediante un soporte,

- una batería (3) conectada al panel solar fotovoltaico (2),

- un controlador de carga (5) conectado tanto a la batería (3) como al panel solar fotovoltaico (2),

- al menos un módulo de conexión (4) a un dispositivo móvil accesible a los usuarios del cargador solar y conectado al controlador de carga (5), y

- medios de anclaje al suelo configurados para mantener el cargador solar fijado al suelo.

2. Cargador solar para dispositivos móviles, según reivindicación 1 **caracterizado** porque el módulo de conexión (4) a un dispositivo móvil es un módulo hembra USB.

3. Cargador solar para dispositivos móviles, según reivindicación 1 **caracterizado** por comprender una plataforma circular de soporte (6) unida a la columna de sujeción (1) configurada para la sujeción de los dispositivos móviles a cargar.

4. Cargador solar para dispositivos móviles, según reivindicación 1 **caracterizado** por comprender una plataforma circular de protección (7) unida a la columna de sujeción (1) configurada para la protección de los módulos hembra USB (4).

5. Cargador solar para dispositivos móviles, según reivindicación 1, **caracterizado** por comprender al menos un asiento (8) unido a la columna de sujeción (1).

6. Cargador solar para dispositivos móviles, según reivindicación 1, **caracterizado** por comprender un disco circular (9) a modo de parasol o paraguas en la parte superior de la columna de sujeción (1) y por debajo del panel solar fotovoltaico (2).

7. Cargador solar para dispositivos móviles, según reivindicación 1, **caracterizado** porque el controlador de carga (5) es un controlador de seguimiento de punto de máxima potencia.

8. Cargador solar para dispositivos móviles, según reivindicación 1, **caracterizado** porque la batería se encuentra dentro de un armario antivandálico.

9. Cargador solar para dispositivos móviles, según reivindicación 1, caracterizado porque los medios de anclaje al suelo consisten en unos pernos de acero en dado de hormigón.

10. Cargador solar para dispositivos móviles según reivindicaciones 2, caracterizado porque el controlador comprende una columna de sujeción (1) de tres metros de altura, un panel solar fotovoltaico (2) de 80W de potencia de dimensiones 1150x535x35mm, una

batería (3) de 12V y 18Ah, un controlador de seguimiento de punto de máxima potencia (5) configurado para regular la carga de la batería (2) convirtiendo la corriente eléctrica de 12V a 5V y cuatro módulos hembra USB.

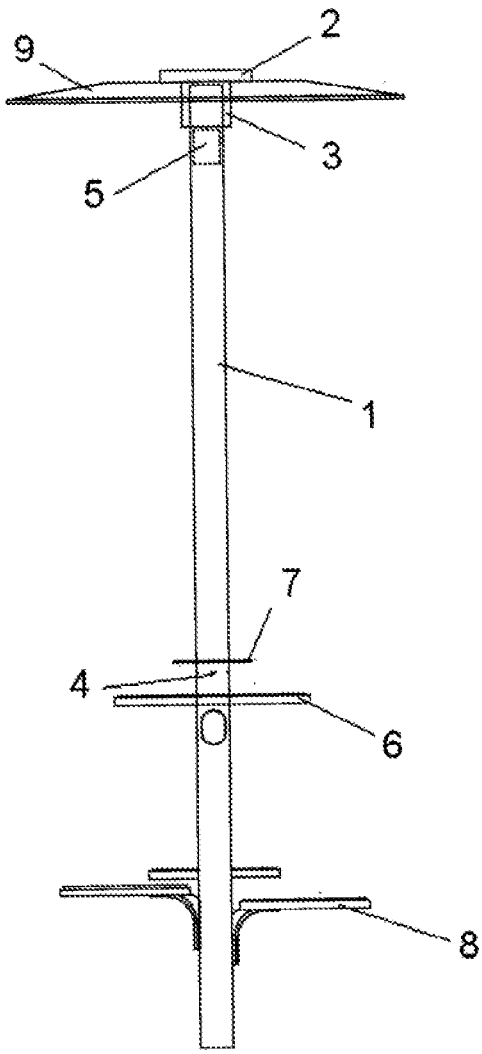


FIG. 1

CASO PRÁCTICO RAMA TÉCNICA

1. En plena pandemia por COVID-19, llega a la Oficina Española de Patentes y Marcas la solicitud de patente **P1**, cuyo objeto es un virus nuevo que provoca un síndrome respiratorio agudo grave (SRAS):

a) Dicha solicitud ¿puede registrarse como patente, como modelo de utilidad o no puede protegerse bajo ninguna de las dos modalidades? Justifique su respuesta.

b) A lo largo de la descripción de **P1** se especifica que el nuevo virus es utilizado en la creación de un medicamento eficaz como tratamiento contra todo tipo de coronavirus. ¿Sería protegible este medicamento? ¿Bajo qué modalidad de protección? Justifique su respuesta.

2. Al tratarse de un medicamento que necesita ser manejado con gran cuidado, se diseña un método a seguir para su administración con pasos concretos y ordenados e instrucciones muy precisas. ¿Sería patentable este método? ¿Sería mejor protegerlo como modelo de utilidad? Justifique su respuesta.

3. En caso de que la invención de **P1** fuera patentable y se registrara como patente, se le asignaría como fecha de presentación el **04-04-2020** y su informe sobre el estado de la técnica anterior (en adelante IET) se realizó **el 02-07-2020,** sin que el examinador encargado encontrase documentos que afectaran a la novedad o a la actividad inventiva del objeto de la solicitud. Nadie presentó observaciones al IET. El examen sustantivo se llevó cabo el **03-01-2021.** Al realizar la búsqueda complementaria, el examinador encontró el documento de patente **I1**, que fue presentado como solicitud internacional PCT (Patent Cooperation Treaty) el **03-04-2020,** entró posteriormente en fase nacional y fue publicado en español el **30-12-2020**

a) De ser relevante para la novedad de **P1**, ¿debería el examinador tener en cuenta el documento **I1**? Justifique su respuesta.

b) ¿Y si fuera relevante para la actividad inventiva? Justifique su respuesta.

c) Un empresario sueco fabrica el mismo producto que desea proteger la solicitud **P1**. Si finalmente se concediera como patente, ¿puede este empresario presentar una oposición? En caso afirmativo, ¿Con qué plazo de tiempo cuenta? Justifique su respuesta

d) Si la oposición contra la concesión de la patente fuera estimada por la Oficina Española de Patentes y Marcas, ¿Puede el solicitante de **P1** solicitar el cambio a modelo de utilidad? Justifique su respuesta.

e) ¿Podría el titular de la patente **P1** solicitar un modelo de utilidad declarando como prioridad la patente **P1?** Justifique su respuesta.

4. Antes de 12 meses desde la fecha de primer depósito el solicitante transmite la solicitud de patente a un tercero también español que solicita una patente europea el último día disponible para reivindicar la prioridad. ¿Qué deberá aportar el solicitante de la patente europea para que la prioridad sea válida ante la Oficina Europea de Patentes?

5. El nuevo titular está fabricando y comercializando el medicamento contra el nuevo virus, pero su agente de la propiedad industrial le comunica la existencia de una publicación científica de fecha anterior a la de prioridad de la solicitud que divulga el procedimiento de obtención del medicamento tal como está definido en las reivindicaciones. El solicitante lamenta no haber reivindicado algunos detalles del procedimiento de fabricación que se encuentran en la descripción y no están divulgados en esa publicación científica relevante. No quiere correr el riesgo de que su patente sea anulada en los tribunales por falta de novedad ¿Qué puede hacer?

6. Un laboratorio competidor presenta posteriormente una solicitud internacional PCT y recibe un informe de búsqueda internacional que le indica lo siguiente:

Categorías	**Documentos citados**	**Reivindicaciones afectadas**
X Y A	DOCUMENTO 1	1-2 3 4
X Y A	DOCUMENTO 2	1 3 2,4
X A	DOCUMENTO 3	4 1-3
D,A	DOCUMENTO 4	1-4

¿Qué se puede deducir de este cuadro sobre las reivindicaciones y de cómo están afectadas su novedad y su actividad inventiva de acuerdo a los documentos citados?

IE0

DESCRIPCIÓN

Termómetro digital para piscinas y similares.

Objeto de la Invención:

Más concretamente la invención se refiere a un termómetro sonda, equipado con unos medios de medición digitales, con la característica esencial que la sonda correspondiente se encuentra convenientemente alejada del cuerpo del termómetro.

Estado de la Técnica:

Existen en el mercado y por tanto pueden considerarse como estado de la técnica una pluralidad de termómetros cuya finalidad última es la medición de la temperatura de los líquidos, dentro de los cuales se conocen el grupo de termómetros de tecnología analógica para la medición de la temperatura del agua de las piscinas.

Dichos termómetros disponen de una sonda en su parte inferior y algunos emplean un conducto cilíndrico para llegar a las capas de líquidos que limitan con la superficie, con lo cual cuando en una piscina o similar existen zonas de sombra o bien de sol, la medición es engañosa porque solo tiene en cuenta la superficie en contacto con el aire sin tener en cuenta profundidades mayores, en las que la temperatura puede ser bastante más baja, con lo que puede ocasionar un gasto de energía excesivo bien para rebajar la temperatura del agua, o bien para incrementarla, dañando la sensación de confort de la persona o personas que utilizan dicha piscina.

Por otra parte la utilización de tecnología analógica para este tipo de termómetros, conlleva una perdida de calidad de la medición, no por la propia tecnología utilizada sino por el coste que representa el contrarrestar el "ruido" de las señales analógicas que se traduce en intervalo de incertidumbre. Esto quiere decir que obtenida una muestra de una señal analógica en un instante determinado, es imposible determinar cual es el valor exacto de la muestra, dentro de un intervalo de incertidumbre que introduce el ruido.

Finalidad de la Invención:

La medición de la temperatura de los líquidos a una altura negativa alejada de la superficie de los mismos, con lo que la medición es más real que otros termómetros que miden a unos 5 a 10 cm. de la superficie, medición correcta pero que no refleja la temperatura del líquido a profundidades distantes de la superficie.

Otro de los fines de la invención es la utilización de medios digitales para la medición de la temperatura, lo que permite una mayor exactitud de la medición así como incorporar sendos programas de software que posibilitan la obtención de valores medios, desviaciones y otros. Una señal digital es aquella cuyas dimensiones (tiempo y amplitud) no son continuas sino discretas, lo que significa que la señal necesariamente ha de tomar unos determinados valores fijos predeterminados en momentos también discretos.

En los dispositivos para medir la temperatura que utilizan tecnología analógica, la lectura se hace a través de una escala que usualmente utilizan valores múltiples de cinco, con rayas entre ellos, mientras que una de las finalidades de la invención es ofrecer al usuario una lectura única en la que aparece un solo valor, el de la temperatura del agua.

Otro de los fines de la invención es la posibilidad de colocar un emisor en el objeto de la invención, que trabaje en colaboración con una pequeña consola con panel LCD equipado con un receptor, para que el usuario pueda recibir la temperatura medida por el termómetro digital en la piscina y saber desde su salón la misma, sin necesidad de desplazarse.

Descripción de la Invención:

La invención preconizada resulta de la combinación en un termómetro para la medición de la temperatura de líquidos, de unos medios electrónicos digitales, unos medios de captación de energía solar que incrementa la capacidad de la batería, y unos medios de captación de la temperatura a una distancia negativa respecto de la superficie de los citados líquidos.

El termómetro objeto de la invención se materializa en un cuerpo de revolución que comprende dos partes, que se unen mediante tornillos o medios equivalentes, en cuyo interior se encuentran los medios electrónicos digitales, tal como un circuito electrónico digital, que recibe las ordenes ejecutadas desde la parte superior, a través de un conjunto de pulsadores previstos en la base superior a disposición del usuario, quien gobierna a través de dichos pulsadores después de visualizar las mediciones de temperatura de la sonda, e interpretadas a través del software incorporado a dicho circuito electrónico digital, y la señal procedente de una sonda incorporada en un conducto tubular de longitud superior a 15 cm.

El termómetro según es otro de los fines de la invención, permite dos formas distintas de utilización, una de ellas convencional es decir flotando libremente en la superficie del líquido y moviéndose en función de las corrientes internas del recipiente en donde de se almacenan dichos líquidos, o bien inmovilizado a un punto fijo de dicho

recipiente, al haberse diseñado el cuerpo del mismo en su parte inferior en un saliente provisto del correspondiente orificio.

Adicionalmente el termostato según es otro de los fines de la invención, incorpora en el circuito eléctrico digital un emisor de señales de radiofrecuencia que trabaja en colaboración con una pequeña consola con pantalla LCD y el receptor correspondiente en el que aparece la lectura censada por el termómetro en el agua de la piscina, en un punto alejado de la misma.

Otros detalles y características se irán poniendo de manifiesto en el transcurso de la descripción que a continuación se da, en las que se hace referencia a las figuras que a la misma se acompaña, en las que se muestran a título ilustrativo pero no limitativo una representación gráfica de la invención.

Descripción de las figuras:

La figura nº 1 es una vista en planta superior de la zona interior de la parte superior (11) del cuerpo del termómetro (10).

La figura nº 2 es una vista en planta superior de la zona interior de la parte inferior (12) del cuerpo del termómetro (10).

La figura nº 3 es una vista en planta superior de la base superior (27) de la parte superior (11) del termómetro (10).

La figura nº 4 es una vista inferior en planta de la parte inferior (12) del termómetro (10), en la que puede verse la protuberancia (14) en la que se ha previsto el orificio (15).

La figura nº 5 es una vista por "1" según figura nº 4.

La figura nº 6 es una vista frontal en alzado del termómetro (10), en la que se aprecia el cuerpo del mismo, que comprende la parte superior (11) la parte inferior (12) unidos a presión por la zona de contacto (13) y mediante los correspondientes tornillos y de la extensión (17) que incluye en su extremo inferior la sonda (18).

Sigue a continuación una relación detallada de las distintas partes de la invención que se encuentran identificadas con el número correspondiente en las figuras anexas; (10) cuerpo del termómetro, (11) parte superior de (10), (12) parte inferior de (10), (13) zona de contacto, (14) protuberancia, (15) orificio, (16) extensión de (12), (17) conducto tubular, (18) sonda, (19) placa electrónica, (20) tornillos, (21) batería, (22) orificios, (23) cavidades, (24) orificios, (25) torreta, (26) orificios, (27) base superior de (11), (28) piezas de plástico, (29) células solares, (30) pantalla, (31) botones, (32) tapón protector.

Descripción de una realización de la Invención:

En una de las realizaciones preferidas de la invención y tal y como puede verse en la figura nº 6, un termómetro (10) esta formado por un cuerpo de cuya zona inferior (16) emerge un conducto tubular (17), en cuyo extremo inferior se encuentra una sonda (18).

El cuerpo del termómetro (10) comprende una parte superior (11) y una parte inferior (12), la cual a su vez se prolonga inferiormente en una extensión a modo de cuerpo de revolución (16) en la que se encaja el conducto tubular (17), y en su parte inferior una sonda (18) protegida por un tapón (32). La parte superior (11) presenta una configuración sensiblemente cilíndrica de escasa altura, mientras que la parte inferior (12) es un cuerpo de revolución de generatriz alabeada uniéndose (11) y (12) por la zona de contacto (13).

La parte superior (11) se solidariza con la parte inferior (12) con el auxilio de sendos tornillos que atravesando la parte (11) por los orificios se roscan en los respectivos alojamientos. En dicha parte superior (11) y en su base superior (27) tal y como puede verse en la figura nº 1, se incorpora unos medios electrónicos digitales, tal como la placa electrónica (19), inmovilizada en la cara interior de la parte superior (11) mediante tornillos (20).

También en la base (27) de la parte superior (11) y en la cara vista de la misma, tal y como puede verse en la figura nº 3, se disponen de unos medios de gobierno y control de la temperatura, tales como una pantalla (30) y unas células solares (29), las cuales realimentan la batería (21). Los medios de gobierno del termómetro (10), los botones (31) y los de control, de la pantalla (30).

A diferencia de lo que es conocido en el estado de la técnica, no existen termómetros tales como (10) que utilicen tecnología digital, en combinación con unos medios de medición de la temperatura del agua por debajo de 15 cm., totalmente autónomos merced a la existencia de unos medios de realimentación de la batería (21) mediante células solares (29), pudiendo dichos termómetros (10) flotar en el agua libremente, o quedar inmovilizados a un punto fijo, sirviéndose del orificio (15) con el cual puede anclarse (10) previsto en una extensión de la parte inferior (12) y más concretamente en la torreta (25) previsto en (16).

Descrito suficientemente la presente invención en correspondencia con las figuras anexas, fácil es comprender que podrán realizarse en la misma, cualesquiera modificaciones de detalle que se estimen convenientes siempre y cuando no se altere la esencia de la invención que queda resumido en las siguientes reivindicaciones.

REIVINDICACIONES

1º — "TERMOMETRO DIGITAL PARA PISCINAS Y SIMILARES" de los que flotan en piscinas y depósitos conteniendo líquidos y comprende un cuerpo que incorpora medios electrónicos que convierten la temperatura detectada por una sonda en lectura a través de una pantalla o similar, caracterizado por que dicho termómetro comprende un cuerpo de revolución de generatriz alabeada, en cuya base superior de la parte superior se encuentran unos medios de adaptación de energía tal unas células solares, unos medios de gobierno tal como unos pulsadores, y unos medios de lectura tales como una pantalla, la cual visualiza valores de temperatura medidos mediante una sonda situada a más de 15 cm. de dicha base superior, mediante unos medios electrónicos tales como un circuito electrónico utilizando tecnología digital.

2º — "TERMOMETRO DIGITAL PARA PISCINAS Y SIMILARES" según la 1º reivindicación, caracterizado por que el cuerpo del termómetro comprende una parte superior sensiblemente cilíndrica de escasa altura, que se une a una parte inferior tal como un cuerpo de revolución de generatriz alabeada, que se prolonga inferiormente en un conducto tubular en cuya parte se instala una sonda protegida por un tapón cilíndrico.

3º — "TERMOMETRO DIGITAL PARA PISCINAS Y SIMILARES" según la 1º reivindicación, caracterizado por que en el interior de la parte superior se monta un circuito electrónico mediante tornillos, incorporando este último la correspondiente batería, realimentada mediante la energía captada por las células solares, dispuestas en la base superior de la parte superior.

4º — "TERMOMETRO DIGITAL PARA PISCINAS Y SIMILARES" según la 1º reivindicación, caracterizado por que en la parte inferior del cuerpo del termómetro se han previsto una extensión en forma de torreta, en cuya parte central se encuentra un orificio.

5ª — "TERMOMETRO DIGITAL PARA PISCINAS Y SIMILARES" según la 1º reivindicación, caracterizado por que alternativamente el circuito electrónico incorpora un emisor de radiofrecuencia, cuyas señales son recogidas por un receptor instalado en una consola alejada y dotada de una pantalla LCD.

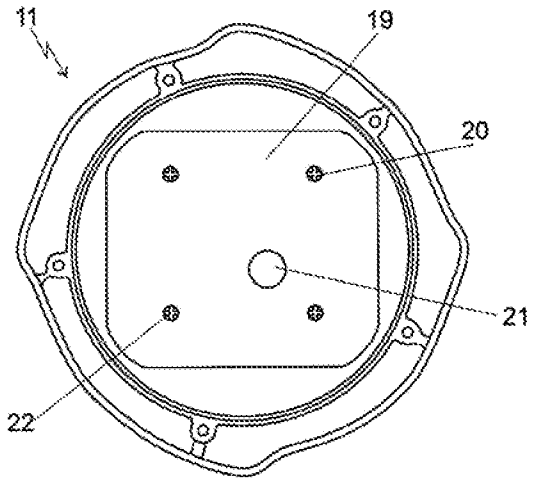


Fig. 1

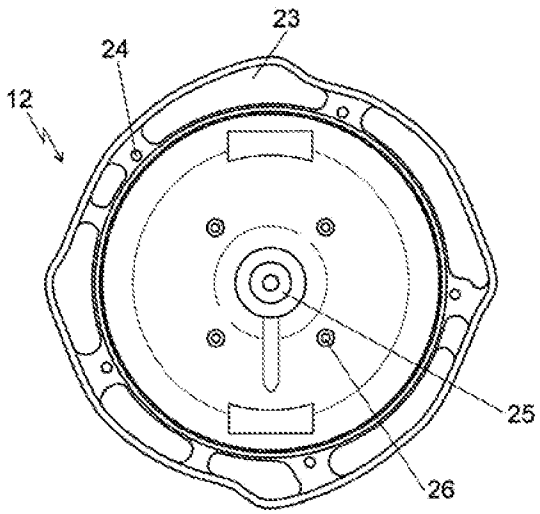


Fig. 2

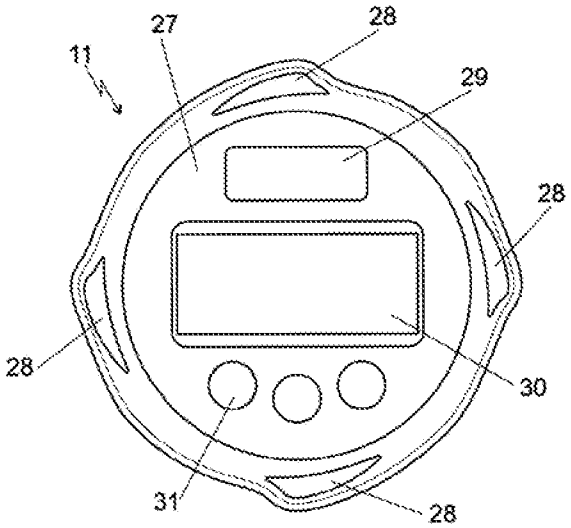


Fig. 3

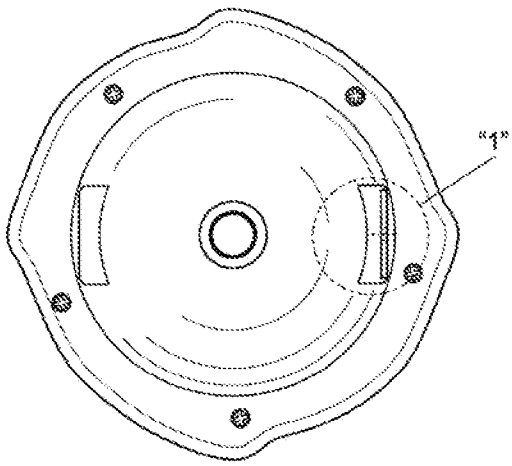


Fig. 4

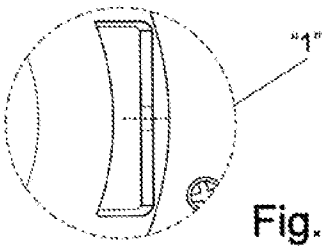


Fig. 5

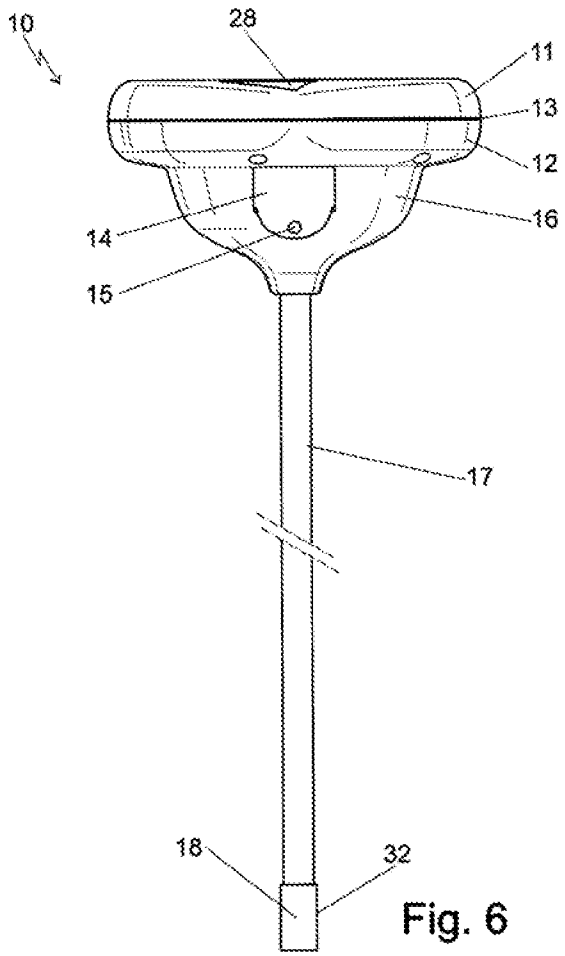


Fig. 6

IE1

Monitoring Device

The present invention relates to a liquid monitoring device, in particular for use in swimming pools, baths, hot-tubs, spas and the like.

It is frequently necessary to monitor water for properties such as temperature, pH, or chemical composition, such as the level of sanitising chemicals such as chlorine, bromine or ozone, in bodies of liquid. The temperature of water in baths and swimming pools is generally elevated to levels that are comfortable to the user. However care must be taken to ensure that they do not reach unhealthy levels, for example, at levels at which there is a danger of scalding.

Furthermore, the chemical nature of the water in swimming pools and the like, for example, the p.H. and the chemical composition, in particular the levels of purifying or sanitising chemicals must be regularly monitored to ensure that they remain within a safe range. The conditions must be such as to prevent or control the growth of organisms such as algae or bacteria and the like, and maintain clear water by reduction of T.D.S. but not at levels at which the chemicals themselves may have a detrimental effect on the health of bathers. In particular it is necessary to prevent the growth of algae and maintain a balance of bacteria levels within a pool.

Monitoring devices and procedures are well known but they tend to be labour and time intensive, requiring repeated water sampling, or immersion and reading of mercury or alcohol thermometers or other temperature measuring devices in the liquid.

A number of floating monitoring devices have previously been proposed, for example US Patent No. 5,681,110, US Patent No. 5,169,236 and US Patent No. 4,503,563. These devices are, by

and large, operated by electrical power from batteries or cells such as solar cells. They include sensors which become immersed in the water, and transmit signals to a display device which is visible above the water level whilst the device is floating in the liquid.

A difficulty with these devices is that they measure the conditions at the surface of the liquid. This is not always appropriate. For example, for temperature measurement, it is recommended that the temperature of water below the surface is monitored. This gives a more accurate measure of the water temperature, as the effect of thermals is averaged out. Also, the chemical composition at the surface of the liquid may not truly represent the composition of the water as a whole as a result of evaporation effect. They may also be unstable if there is turbulence in the water.

According to the present invention there is provided a liquid monitoring device which floats in liquid, comprising a signal element able to indicate a property of liquid and arranged to float above the surface of said liquid, an elongate housing extending below said signal element and arranged so that it is below the surface of liquid when the device is floating therein, and a sensor arranged at an end region of said housing remote from the signal element and arranged to measure at least one property of said liquid, and means for transmitting information from said sensor to said signal element.

The elongate housing of the device of the present invention means that readings from the recommended depth within the liquid can be readily taken. Furthermore, the elongate housing acts as a keel, keeping the device floating upright in the liquid.

Suitably the elongate housing is such that the sensor is located from 15 to 45 cm below the surface of the liquid in which the device is placed, and preferably at about 30 cm below the

surface. In particular the elongate housing may be from 28 to 32cm long. Generally speaking the elongate housing will be watertight, although it will be necessary to ensure that the sensors project into the liquid so that the target property may be measured.

The sensor is suitably one that is adapted to measure temperature, pH, and/or chemical composition, for example the chlorine content, of said liquid. If desired, more than one sensor may be included in the housing. Suitable electronic sensors are available commercially for example from Analytical Sensors Inc., USA.

Preferably, the sensor, the means for transmitting information from said sensor to said signal element and/or the signal element contained within the device are powered electrically using cells such as batteries, which may or may not be rechargeable, and/or solar cells. Suitable batteries for use in the invention include alkali batteries, as well as lithium carbide batteries. They are suitably long-life batteries, which reduce the frequency at which the batteries need to be changed.

Where the device is powered by batteries, these are suitably accommodated within the elongate housing, which is shaped accordingly and which is watertight. The elongate nature of the housing means that there is a possibility that the batteries may be connected in parallel. Furthermore, the presence of batteries increases the weight of the housing and so improves the stabilising properties.

Where the device is powered by solar cells, these are suitably arranged in an upper portion of the device so that they remain above the surface of liquid in which the device is floating. The device may include light reflecting surfaces arranged to direct as much light as possible onto the solar cells. An

example of an arrangement of solar cells is given in.US Patent No. 5,681,110.

If required, solar cells may be used in addition to a conventional battery, and arranged so that one acts as the primary power source and one acts as a back-up power source. Where rechargeable batteries are used, the solar cells may be used to charge these.

The signal element included in the device may comprise a visible display. This is suitably housed within a container, which is at least partially transparent so as to allow the display to be viewed, in an upper portion of the device. Preferably, the container is completely transparent. It may have various shapes, and may include portions, which can act as lenses to enhance the visibility of the display. Furthermore, it is suitably sealed and is shaped or contains a suitable air pressure to ensure that the device is buoyant to the extent that the signal element is visible above the surface of the water.

Suitably the display is a digital display and in particular comprises a liquid crystal display element, as are well known in the art. It may take various forms, including the presentation of figures indicating the status of the property being measured by the sensor or sensors, as well as graphical representations of the status.

Optionally the device further comprises illumination means such as lamps or light bulbs, to improve the visibility of the display, or to allow it to be read at night.

Alternatively or additionally, the signal element may comprise a transmitter, able to transmit information to a remote receiving station. This station may be located for example on the side of the pool, or it may be located in the offices of a pool monitoring company. The remote receiving station suitably

comprises a display device that may include visible displays and/or or audible alerting devices. For example, visible displays such as those described above, may then be produced on a noticeboard or the like at the side of the pool.

The remote receiving station may also be connected to control devices, such as pool heaters, or chemical supply arrangements which may then be able to automatically adjust the conditions of the pool in response to the signal.

The transmitters used in the device may be radio-transmitters, as well as infrared transmitters and the line. Where radio-transmitters are used, there are suitably are able to transmit radiosignals at different frequencies, so that a wavelength may be selected which does not interfere with other local transmitters.

If desired, multiple devices can be floated in different areas of a body of liquid such as a swimming pool, at any one time, each transmitting signals to the same receiving station, which may then combine the values so that an average value is displayed.

In any case, the signal element may further comprise means that gives a visible or audible alarm when the property being measure falls outside acceptable limits.

Where the device includes more than one sensor, more than one property may be measured at any one time. The results may be displayed simultaneously if required, provided a suitable display element is employed. Alternatively, switching means may be provided either on the device itself, or where present on the remote receiving station, to allow the display to be switched between the different properties.

Suitably the electronic circuit responsive to the sensor is adjustable so that the device may be set to record the preferred levels of the target properties for the end user. For example, it would preferably be possible for the results of temperature measurements to be displayed in degrees centigrade or Fahrenheit. Also electronics are suitably adaptable to accommodate the use of different pool chemicals such as chlorine, bromine or ozone. Readings may be taken continuously or at intervals, and in the latter case, the frequency of the readings may be adjustable depending for example on whether the pool is subject to light, medium or heavy use.

The device of the invention may further comprise a shock absorber, arranged to minimise the effects of the device colliding with, for instance the side of a swimming pool, when in use. This may take the form of rubber or inflatable sections, arranged around the upper portion of the device. If the material of this shock absorber is selected appropriately, this may act as a supplementary buoyancy aid to ensure that the device floats upright in liquid.

Preferably, the said elongate housing is removeable to allow the sensors and/or any batteries contained within it to be changed. Thus, the housing is suitably attached to the upper part of the device comprising the signal element, by means of a releasable connection. This connection should be watertight to prevent liquid entering the housing through the joint when the device is floating in the liquid. In one embodiment, this may be achieved using a screw-threaded collar arrangement, combined if necessary with water-tight seals such as may be provided by rubber or plastics O-rings, or by gaskets or the use of sealant compounds such as silicones.

Elements of the device may be supplied separately. In particular, elongate housings for use in a device as described above may be provided separately, preferably with an associated

sensor or sensors integrated therein, to ensure that the seals between the sensor and the housing remain intact. These form further aspects of the invention.

The invention will now be particularly described by way of example with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a front view of a device of the invention;

Figure 2 is a section one line A-A of Figure 1;

Figure 3 is an exploded front view, partially in section of the device of Figure 1; and

Figure 4 is a perspective view showing the device of Figure 1 and a similar device, floating in water.

The illustrated devices (Figure 1) comprise a "head element" (1) comprising an upper transparent portion (2) fixed to a lower body portion (3) by means of a series of screw fixings (4)(Figure 2). The upper portion (2) is suitably of a transparent plastics material such as a clear polycarbonate. It is suitably shaped so as to provide a lens area (2A) through which the contents of the head element (1) are clearly visible.

The joint between upper and lower portions (2,3) of the head element is made watertight by the provision of an "O" ring seal (5), which is compressed between mating surfaces. Gaskets or sealing compounds such as silicones, may be employed in place of the "O" ring if required.

The joint area is surrounded by an outer ring (6) of a plastics or rubber material. This acts as a shock absorber when for instance, the device collides for example with a wall of the

pool or bath. Depending upon the nature of material of the ring (6), it may also assist in the buoyancy of the device.

Contained within the upper portion (2) and visible from either side of the head element (1) is a pair of inclined digital liquid crystal display devices (7,8), each supported at their lower ends on a platform (9) connected to the body portion (3) of the head element (1) and fixed at the top to the upper portion (2). The angle at which the display devices (7,8) are inclined is selected so that they may be readily readable from the side of a pool in which the device is floating.

The lower portion (3) of the head element (1) is suitably of a hard plastics material such as a polycarbonate material. It is provided with a downwardly projecting annular flange (10) in the centre, which is arranged to accommodate an upper portion of an elongate cylindrical housing (12). The outer surface of the flange (10) is screw threaded to allow it to be connected to the housing (12) by means of a collar (13), which has an internal screw thread and which is arranged to abut against an annular flange (14) projecting from the side of the housing (12). A further O-ring (15) is provided to form a water-tight seal between the housing (12) and the lower portion (3) of the head element.

The lower end of the elongate housing (12) is provided with a series of openings (16). It is also shaped to accommodate the body (11) of a probe or sensor (17). An O-ring (18) is provided to form a watertight seal between the body (11) and the housing (12).

When the probe (17) is contained within the housing (12), sensory elements (19) are arranged below the O-ring seal (18) and therefore are exposed via the openings (16) to the surroundings.

The probe (17) may include one or more set of sensory elements (19) as are understood in the art. These include temperature sensors such as thermistors, pH sensors and/or oxidation reduction potential sensors as are well known in the art and are described for example in US Patent No. 5,681,110. They generally provide a variable voltage in direct relation to the property they are measuring. The voltage information is processed on a circuit board (not shown) and generates a signal, usually an analogue or digital signal, which may be used to drive the liquid crystal display devices (7,8) as would be understood in the art. The circuit board may be suitably be contained within the device either within the probe body, or more usually, within the head element (1). An amplifier circuit (not shown) may be provided in the probe body if for example, spurious signals are affecting the result and/or the signal has to be transmitted over a large distance.

The top of the probe (17) is provided with an electrical contact (20), fitted to a cap of the probe (21). A cluster of batteries (22) in series alignment is provided in the housing (12) fitted between a contact (20) on the top of the probe (17) and a tube end moulding (23) provided in the head element (1).

A voltage differential signal recordable in millivolts, is sent from the probe (17) to the electronic circuit board in the head element (1) via a series of shielded cables (24, 25) (Figure 3). They electronic circuit board include software which is able to interpret variations in the signals, based upon the preferences and configuration of the controls. These preferences and configurations may be preset, or may be adjustable by the user.

In use, the device of the invention is floated in liquid such as the water in a swimming pool or the like (Figure 4). The device is designed so that when floating, the housing (12) and the lower body portion (3) are submerged, with the water surface at the level of the ring (6).

Water contacts the sensor elements (19) through the openings (16) in the lower portion of the housing (12). These elements form part of a circuit which includes the batteries (22) and the liquid crystal displays (7,8). Specifically, the sensor (19) is sensitive to various conditions in the water, such as temperature, which create small variations in the electrical signals being sent to the electronic circuit board. These variations are interpreted by the software in the device, which then produce an appropriate visible read-out on the display elements (7,8).

An alternative design of the head element (1) is illustrated on the left hand side of Figure 4. In this case, the upper transparent housing (2) is spaced from the display elements (7,8).

When the batteries (22) require changing, the housing (12) is disconnected from the head element (1) by releasing the collar (13). New batteries can then be installed and the collar (13) retightened. This action automatically connects the batteries into the circuit and so the electronic controls operate immediately. Since the probes themselves may require changing periodically, these too may be changed in a similar way. Preferably however, the probe (17) is fixed into the housing (12) permanently, to minimise the risk of water leakage, and therefore the entire housing (12) with the probe (17) is discarded at this time and replaced by a new unit.

The device of the invention can provide continuous and reliable monitoring of the conditions of a liquid such as water in a swimming pool. It requires little maintenance and is easy to read. Measurements taken are at the optimum depth in the water.

Claims

1. A liquid monitoring device which floats in liquid, comprising a signal element able to indicate a property of liquid and arranged to float above the surface of said liquid, an elongate housing extending below said signal element and arranged so that it is below the surface of liquid when the device is floating therein, and a sensor arranged at an end region of said housing remote from the signal element and arranged to measure at least one property of said liquid, and means for transmitting information from said sensor to said signal element.

2. A liquid monitoring device according to claim 1 wherein said elongate housing is such that the sensor is located from 15 to 45 cm below the surface of the liquid in which the device is placed.

3. A liquid monitoring device according to claim 2 wherein the housing is from 28 to 32cm long.

4. A liquid monitoring device according to any one of the preceding claims wherein the said sensor is adapted to measure temperature, pH, and/or chemical composition of said liquid.

5. A liquid monitoring device according to any one of the preceding claims wherein the sensor, the means for transmitting information from said sensor to said signal element and/or the signal element are battery operated.

6. A liquid monitoring device according to claim 5 wherein the elongate housing is adapted to accommodate one or more batteries required to operate said sensor, the means for transmitting information from said sensor to said signal element and/or the signal element.

7. A liquid monitoring device according to claim 5 further comprising solar cells which are arranged to operate the sensor, the means for transmitting information from said sensor to said signal element and/or the signal element.

8. A liquid monitoring device according to any of claims 1 to 4, wherein the sensor, the means for transmitting information from said sensor to said signal element and/or the signal element is powered by solar cells.

9. A liquid monitoring device according to any one of the preceding claims wherein the signal element comprises a display, housed within a transparent container.

10. A liquid monitoring device according to claim 9 wherein the display is a digital display.

11. A liquid monitoring device according to any one of claims 1 to 8 wherein the said signal element comprises a transmitter, able to transmit information to a remote receiving station.

12. A liquid monitoring device according to any one of the preceding claims wherein the said elongate housing is removeable.

13. A liquid monitoring device according to any one of the preceding claims which further comprises a buoyancy aid, arranged to maintain the device floating in liquid such that the signal element is above the waterline and the elongate housing below the waterline.

14. An elongate housing for use in a device according to any one of the preceding claims.

15. A combination of an elongate housing and a sensor for use in a device according to any one of claims 1 to 13.

16. A liquid monitoring device substantially as hereinbefore described with reference to the drawings.

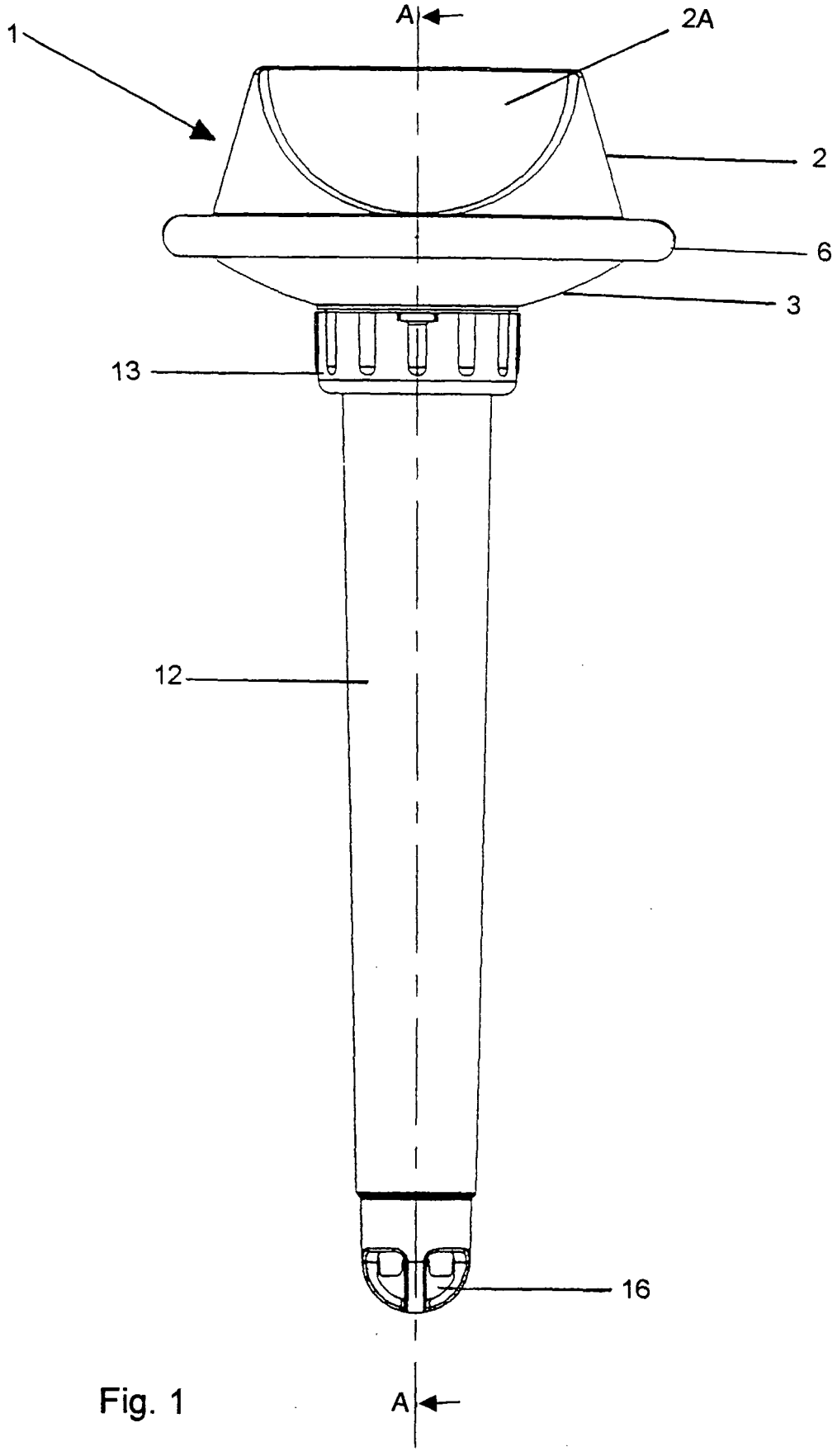


Fig. 1

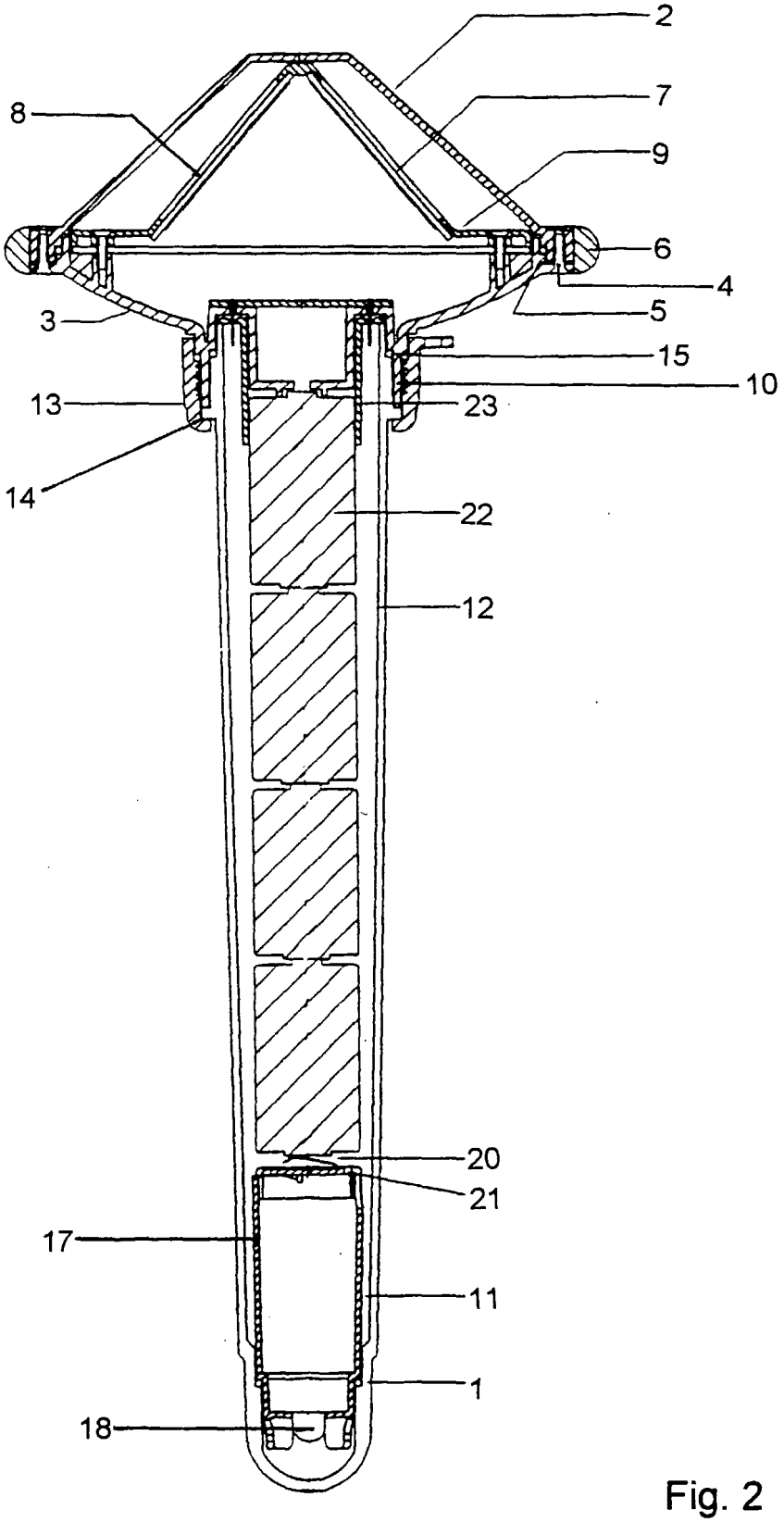


Fig. 2

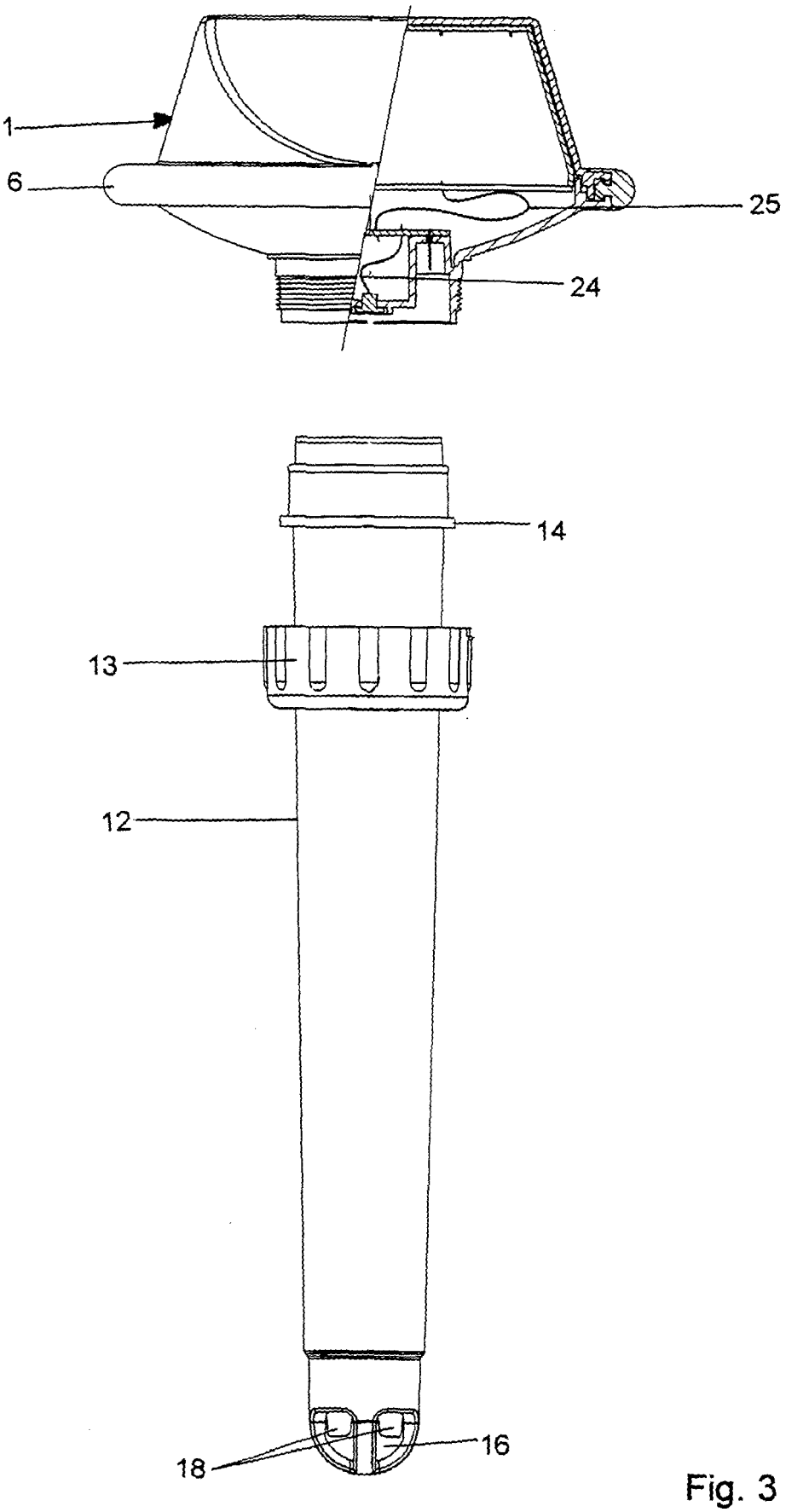


Fig. 3

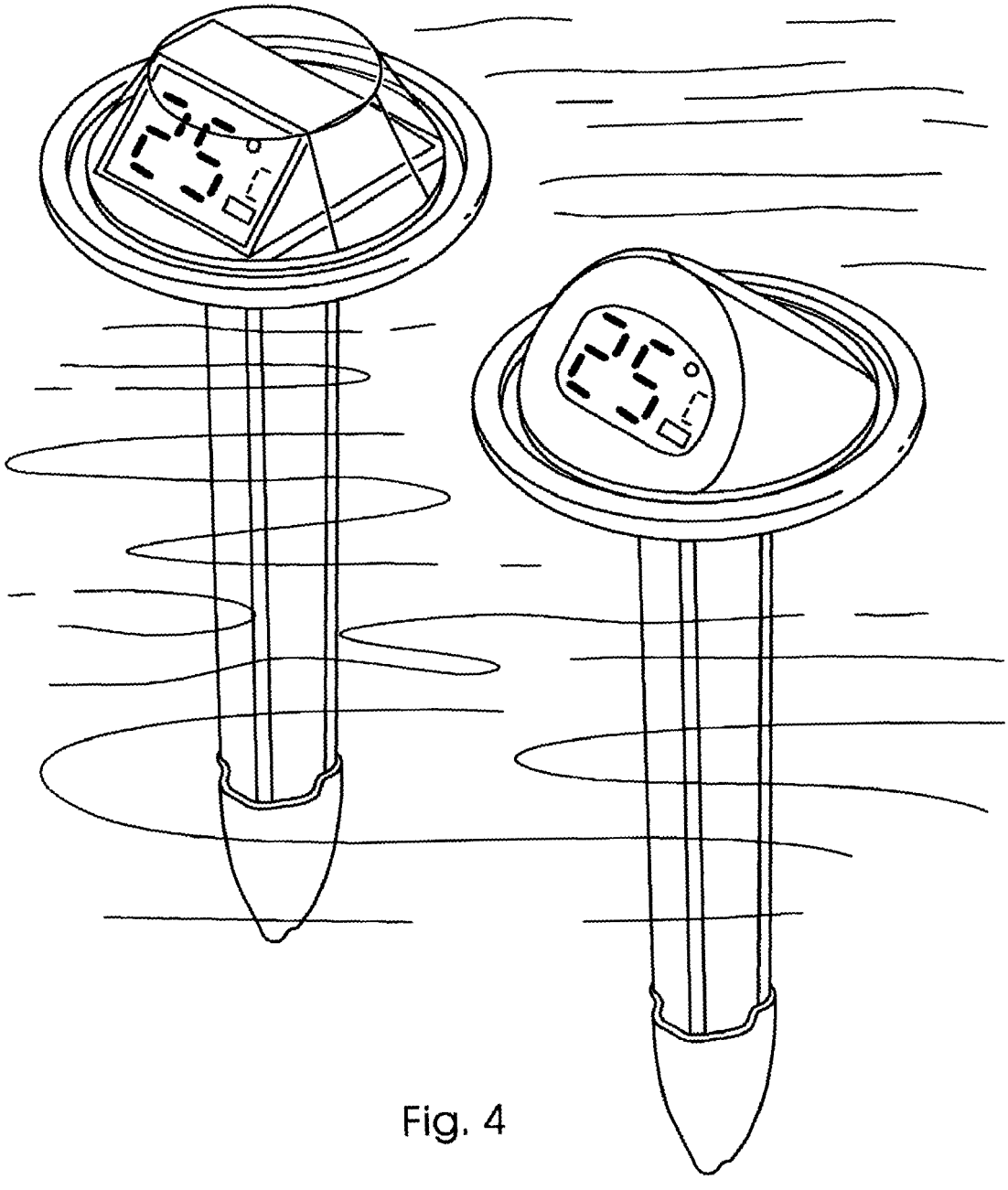


Fig. 4

IE2

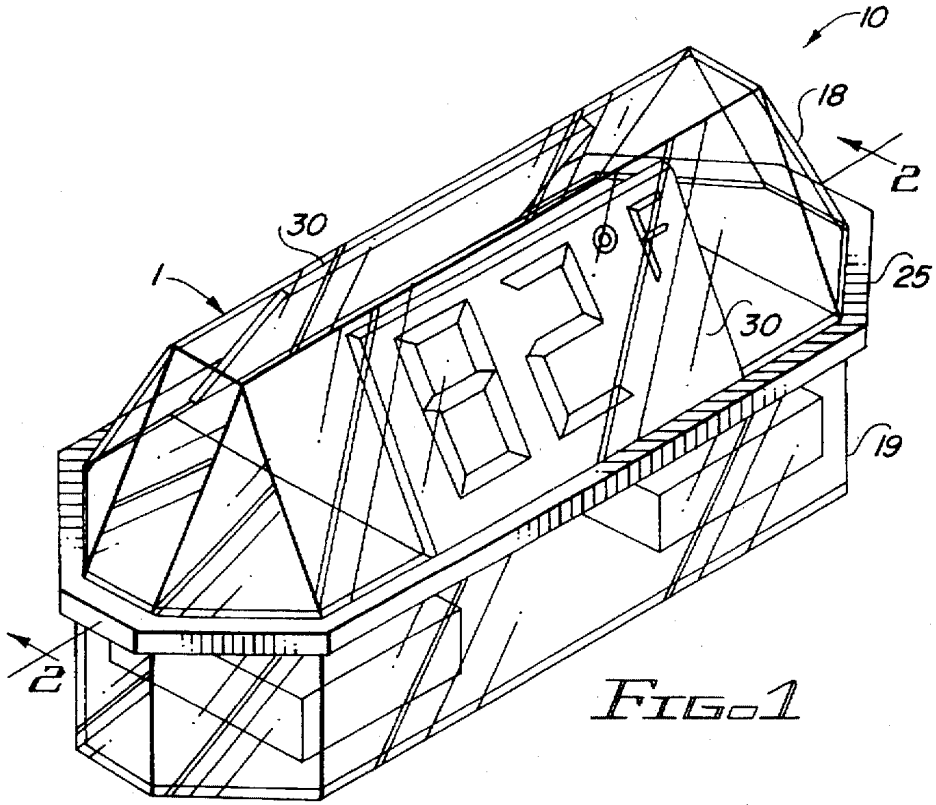


FIG-1

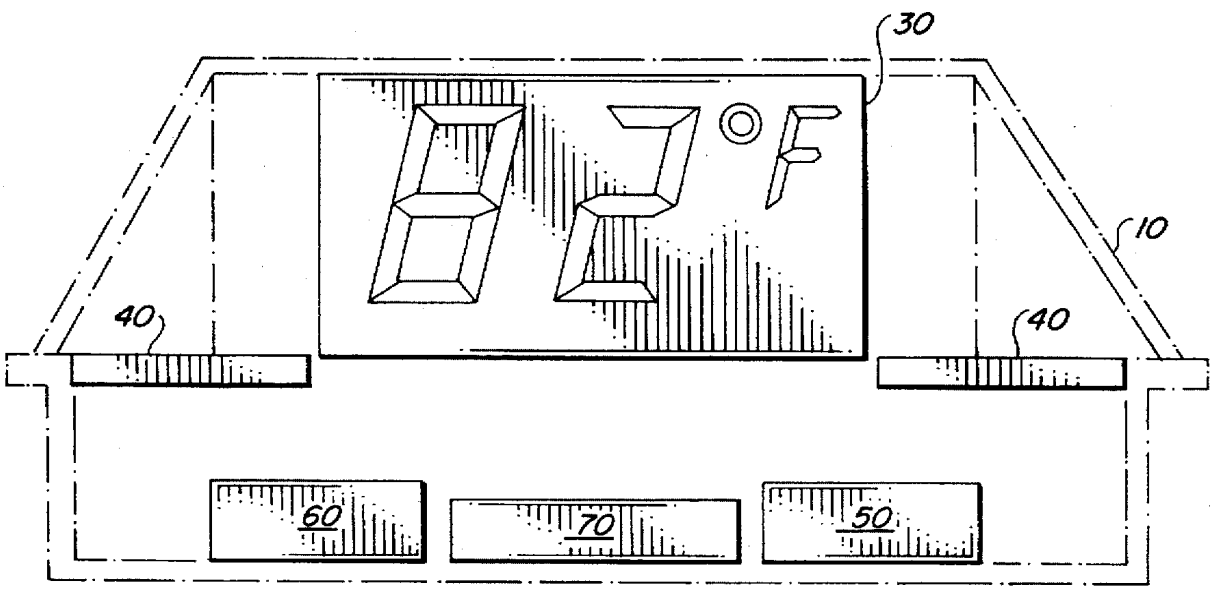


FIG-2

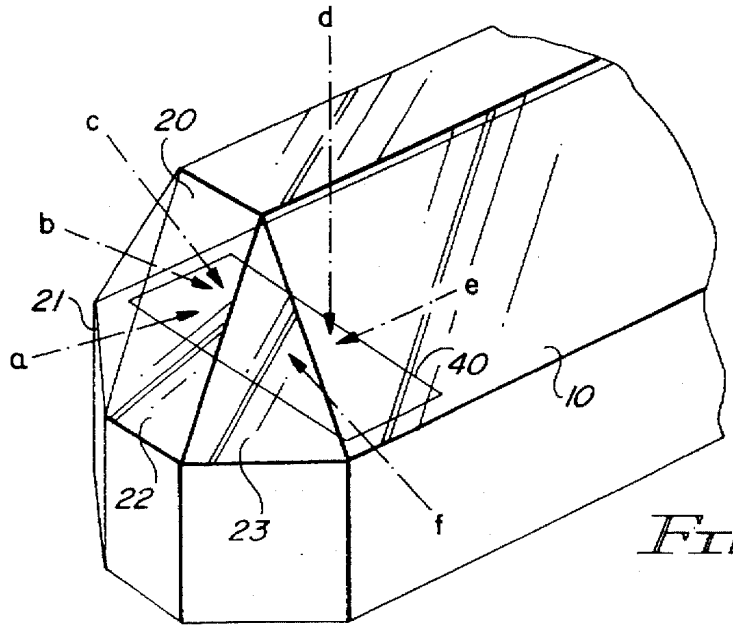


FIG-4

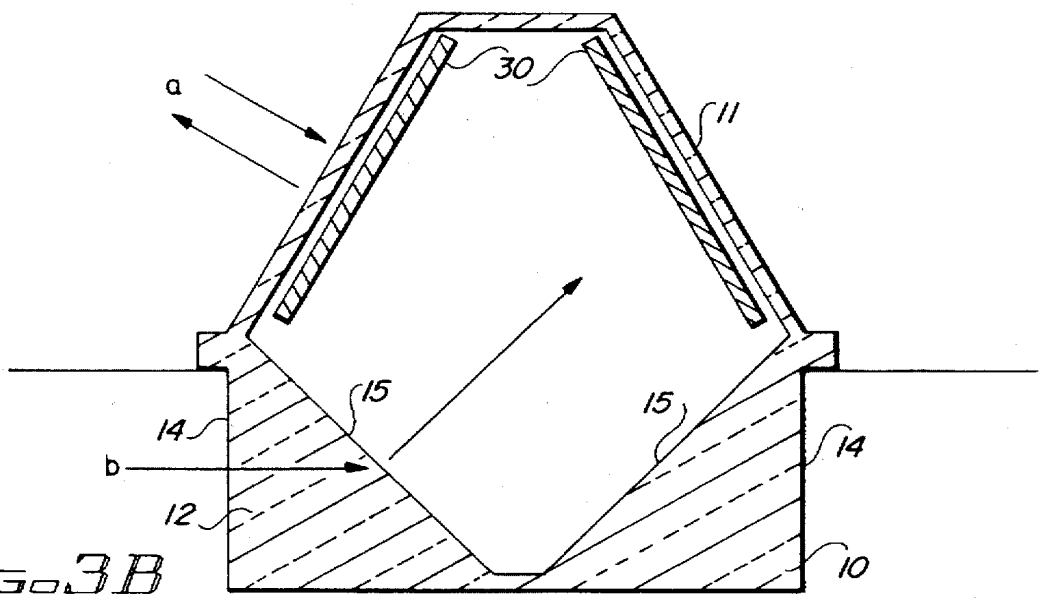


FIG-3B

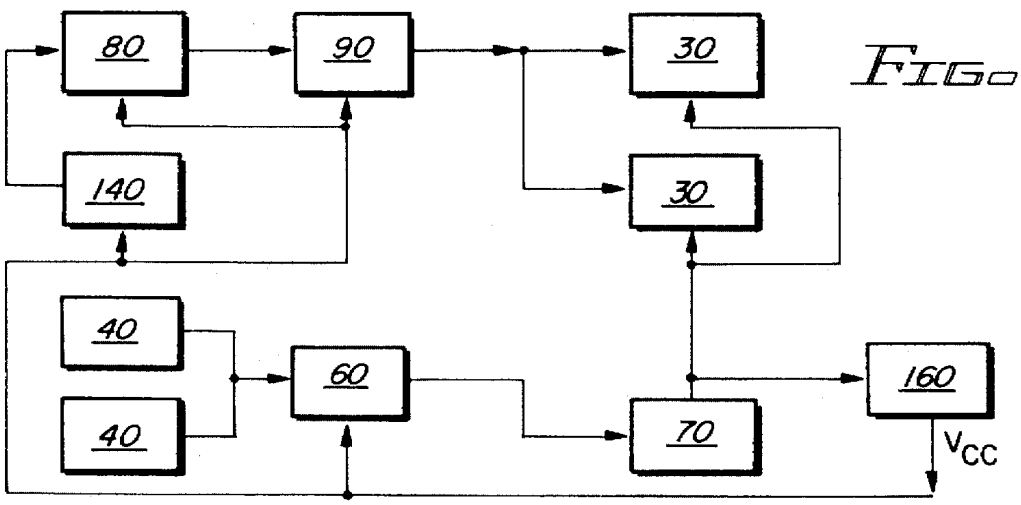


FIG-5

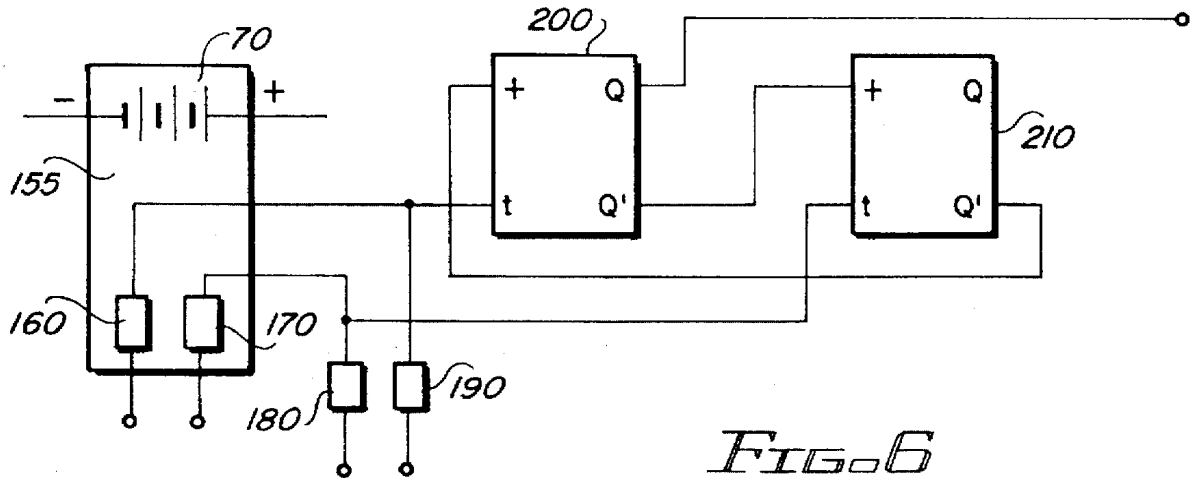


FIG-6

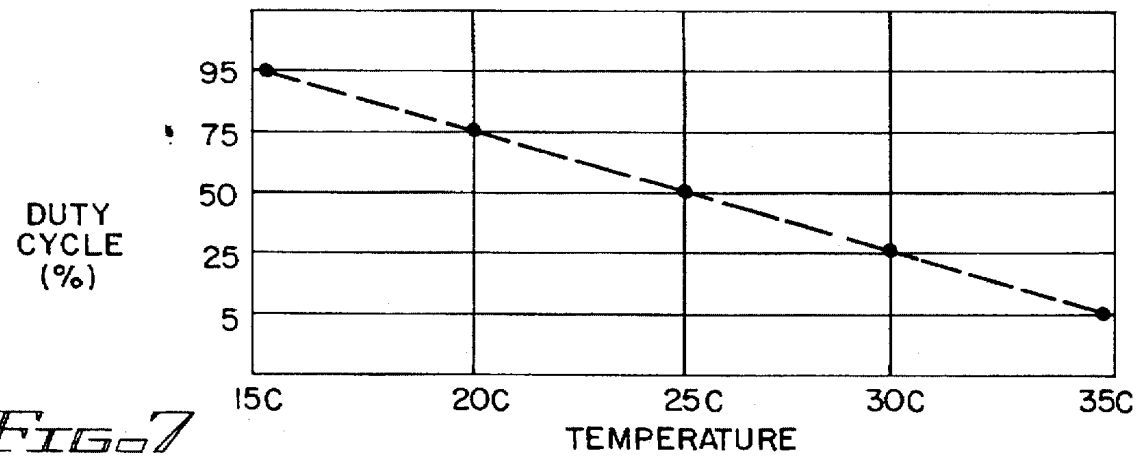


FIG-7

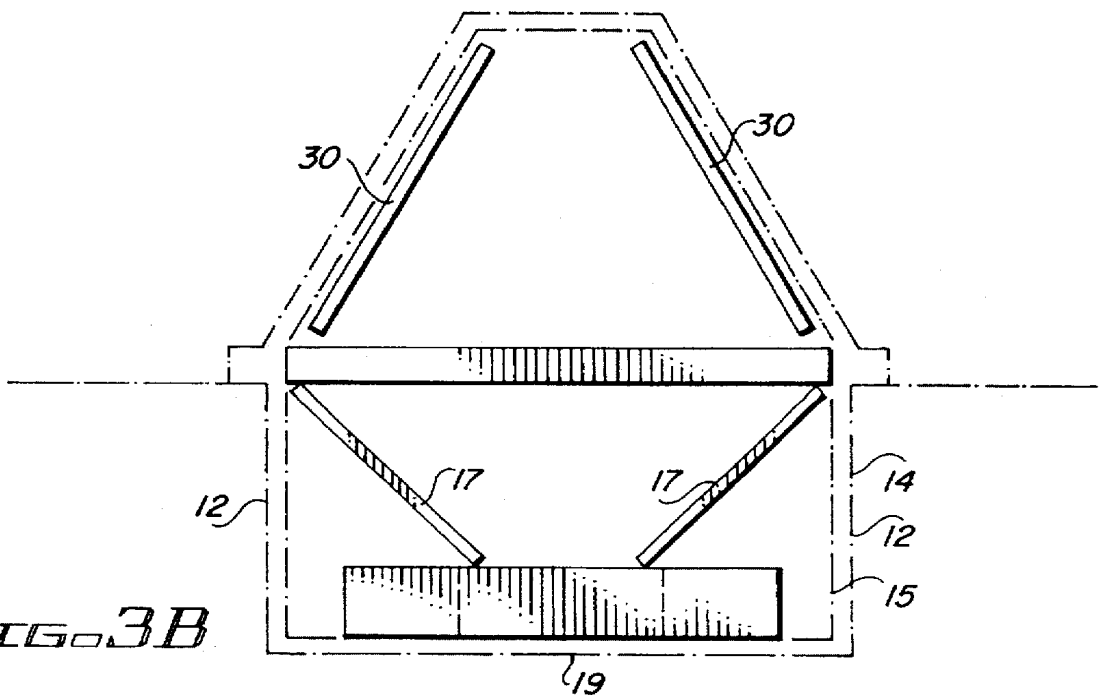


FIG-3B

SWIMMING POOL TEMPERATURE MONITOR

FIELD OF THE INVENTION

This invention relates generally to pool gauges, and more specifically to a pool water temperature meter that automatically and continually displays the water temperature of a swimming pool.

BACKGROUND OF THE INVENTION

Typically, devices for monitoring water temperature in swimming pools employ mercury thermometers or the like. This type of device has the advantage of being independent from any power supply, because it requires none to run. However, because this type of device is difficult to read from any distance, it generally has to be removed from the water in order to be read, not to mention the problems involved with determining the temperature at night.

The idea of utilizing liquid crystal display ("LCD") to create a larger, more visible display may partially address the visibility problem, but it raises other considerations, primarily regarding supplying power to the LCD and to the circuitry necessary to provide a digital representation of the water temperature. If the power is supplied by a standard battery, the battery will have to be replaced frequently to keep the device in working order. The additional power needed to illuminate the LCD, so that it can read at night, not only greatly increases the power drain but poses safety risks as well.

Solar rechargeable batteries can be used to avoid the battery-replacement problem, but this creates new problems with overheating, as well as the challenge of creating a device which maximizes exposure of the solar panel to the sun.

There is a need for a device that automatically and continually displays the water temperature of a swimming pool, and should be visible during both daylight and night in a typical pool. There is an additional need for such a device that can be left in the pool for extended periods of time without requiring user input or replacement batteries. In addition, there is a need for such a device to be safe and durable.

SUMMARY OF THE INVENTION

The present invention fulfills the need in the art. Broadly described, the present invention provides a pool water temperature meter that automatically and continually displays the water temperature of a swimming pool.

In a preferred embodiment of the present invention, the water monitoring device includes a substantially transparent, buoyant housing having an upper portion and a lower portion. The device floats in the water with the upper portion substantially above water. A conditions sensor is disposed primarily within the housing (extending partially from the housing). This sensor measures select physical conditions of the water. A display is disposed within the housing for displaying the conditions such that the conditions can be read through the housing. The lower portion of the housing is structured to refract light from outside the housing onto the display. A communicator is also disposed within the housing. This element communicates the conditions from the conditions sensor to the display. A rechargeable battery is disposed within the housing for powering the device. Finally, a solar panel is disposed within the housing for recharging the battery. The upper portion of the housing is structured to refract light from outside the housing onto the solar panel.

In the preferred embodiment, the display is digital. The display has a front side and a back side, with the conditions displayed on the front side. The display is translucent so that it can be illuminated from its back side. The lower portion of the housing includes a lower interior face and a lower exterior face. The lower interior face is disposed at an angle with respect to the lower exterior face such that light passing from outside the housing through the lower exterior face is refracted as a result of that angle toward the back side of the display.

The upper portion of the housing should include a facade and an end. The front side of the display is visible through the facade, while the solar panel is disposed near the end. The end includes facets which are disposed at angles to one another and facing the solar panel so that light passing from outside the housing through the facets will be refracted toward the solar panel.

Preferably, the conditions sensor has a water temperature transducer which provides a voltage proportional to the water's temperature. The communicator therefor includes a processor (which processes the voltage into a primary digital signal) and a driver (which drives the display according to the primary digital signal).

A control module is preferably provided for controlling the solar panel's rate of recharging the battery so that the battery's temperature remains within a predetermined range. This control module further includes a battery temperature sensor (for gauging the battery's temperature) and a shifting mechanism which decreases the rate of recharging whenever the battery's temperature exceeds a predetermined temperature and increases the rate of recharging whenever the battery's temperature is below that predetermined temperature.

The device could also include a clock for keeping real time, and the conditions sensor can further include an acidity sensor for monitoring a pH level of the pool and an ORP sensor for monitoring an oxidation reduction potential of the pool. The processor would process the real time, the pH level, and the oxidation reduction potential into additional digital signals. The driver additionally would drive the display according to these additional digital signals. A switching mechanism could be provided to alternate according to which among the digital signals the driver drives the display.

An alternate form of the present invention provides a substantially transparent, buoyant housing having an upper portion and a lower portion, the upper portion having a facade and an end. A conditions sensor is disposed primarily within the housing, extending partially from the housing, for measuring a select physical condition of the water. A processor processes the condition into a corresponding digital signal. A driver drives the display according to the digital signal.

Preferably, the conditions sensor includes a water temperature transducer for providing a voltage proportional to the water's temperature. The corresponding digital signal includes a primary discrete digital signal processed by the processor from the voltage.

If a clock is provided for keeping real time, and if the conditions sensor further includes an acidity sensor for monitoring a pH level of the pool and an ORP sensor for monitoring an oxidation reduction potential of the pool, then the corresponding digital signal further includes a set of additional discrete digital signals as a result of the processor's processing the real time, the pH level, and the oxidation reduction potential. A switching mechanism can be

provided for alternating according to which among the discrete digital signals the driver drives the display.

In an alternate form of the present invention, a substantially transparent, buoyant housing has an upper portion and a lower portion, the upper portion having a facade and an end. A water temperature transducer provides a voltage proportional to the water's temperature. An acidity sensor monitors a pH level of the pool. An ORP sensor monitors an oxidation reduction potential of the pool. A clock keeps real time. A processor processes the voltage, the pH level, the oxidation reduction potential, and the time into corresponding digital signals. The digital display alternately displays the water's temperature, the pH level, the oxidation reduction potential, and the time. The switching mechanism alternates according to which among the digital signals the driver drives the display.

Accordingly, it is an object of the present invention to provide a device which is intended to be left in the pool for extended periods of time, and be powered over the long-term by means of a solar-charged internal battery pack.

It is a further object of the present invention to provide a device which is simply placed in the pool and operates automatically. User controls and adjustments are neither provided nor necessary for proper operation.

It is yet a further object of the present invention to provide a device which can visibly operate during both daylight and night in a typical pool.

It is a further object of the present invention to provide a device which has been designed to maximize safety and product life.

These and other objects, features, and advantages of the present invention may be more clearly understood and appreciated from a review of the following detailed description of the disclosed embodiment and by reference to the appended drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

FIG. **1** is a perspective view of the preferred embodiment of the present invention;

FIG. **2** is a cut-away front view of the preferred embodiment along line **2**—**2** in FIG. **1**.

FIG. **3**A is a cut-away view of the preferred embodiment of the subject unit as viewed from its end.

FIG. **3**B is a cut-away view of an alternate embodiment of the subject unit as viewed from its end.

FIG. **4** is a detailed view illustrating a particular feature of the preferred embodiment.

FIG. **5** is a block diagram of the preferred embodiment's electronics.

FIG. **6** is a schematic of the circuitry of a feature of the preferred embodiment.

FIG. **7** is a plot of typical duty cycle rates for the recharging feature of the preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, in which like numerals indicate like elements throughout the several views, FIG. **1** illustrates a perspective view of the subject device **1**, which is intended to float on the surface of a swimming pool.

Enclosure **10** is preferably formed of plastic or a like material. It is designed to hold the operational components, as well as provide the buoyancy to keep the device afloat. Ring **25**, preferably made of a soft elastomer, is disposed between the upper and lower portions **18**, **19** of the housing **10**, and provides a rub-rail surface to buffer contact with the sides of the pool. While not visible in this figure, a tie down point can be provided from which the device can be anchored, if desired. In the preferred embodiment, display **30** is a liquid crystal display (LCD), visibly showing the water temperature. A digital display **30** is preferably because it eliminates any parallax that may be encountered in analog devices. Only partially visible in this view, an additional display **30** is provided on the reverse side of the unit.

FIG. **2** depicts a cut-away front view of the preferred embodiment along line **2**—**2** in FIG. **1**. This figures shows the placement of the internal components within the case **10**. The component placement, while not essential to the operation of the device, has been chosen for optimal performance and to improve many features of the subject device. An LCD **30** is disposed on each side of the unit. Only one LCD **30** is visible in this figure; the other is directly behind it. The LCD's **30** utilized in the preferred embodiment of the subject unit are of the trans/flective type, which can be illuminated either by front or back lighting. The particular utility of these properties of the trans/flective type display **30** in improving the operation of the subject unit will be discussed later in this disclosure.

Solar cells **40**, of which there are preferably two, are utilized to charge the internal batteries **70** of the subject unit. Solar cells **40** are disposed as shown at either end of the device for maximum exposure to available light. It is the combination of concerns about the visibility of the LCD **30** and the exposure of the solar cells **40** which drives the overall configuration of the housing **10** and the placement of the components within the device. Sensor electronics panel **50** contains a sensor element (or elements, as discussed later), sensor circuitry, and display-driver electronics. Power control module **60** contains circuitry for controlling the charge rate of the internal batteries **70**, a feature the benefits of which will be made apparent later. The size of the sensor electronics panel **50** and the power control module **60** is exaggerated in this view. Current technology allows this circuitry to be contained in a very small volume.

FIG. **3**A depicts a cut-away view of the preferred embodiment of the subject unit as viewed from its end. Display units **30** are disposed just below the facade **11** of the unit housing **10**. The housing **10** itself is preferably a hard, clear plastic such as plexiglas. As discussed earlier, the LCD **30** are trans/flective. As sunlight or any bright exterior light shines on the unit, as depicted by arrows (a), the light reflects off the front of the display unit **30**, making the displayed characters highly visible. This takes advantage of the reflective property of the display. The device is designed so that the display **30** will be visible in low light conditions as well.

As illustrated in this view, below the pool surface and beneath each display **30**, sides **12** are horizontal on the exterior **14** but angles on the interior surface **15**. This is so that this portion of the sides **12** can act in e manner of a lens to provide "passive" back lighting for the LCD's **30**. At night, or whenever there is insufficient exterior light for reflective display, the light depicted by arrow (b)—from the underwater lights within the swimming pool enters the sides **12** of the housing **10**. The lens formed by the interior plexiglas surface **15** will refract the light, focusing it on the rear of the displays panel **30**. Since the display panel **30** is a transflective type, the swimming pool light can act as back

lighting, utilizing the transparent/translucent properties of the display **30**. While providing good contrast ratios, this configuration eliminates the need for power-hungry and potentially hazardous high voltages which are associated with traditional back-lighted LCD displays. In this illustration, reflective and refractive paths (a) and (b) are shown on only one side of the unit for illustrative purposes. Of course, during actual operation, light can strike the unit from either side.

FIG. **3B** illustrates an alternate embodiment of the back light lens. In this embodiment, below the pool surface and beneath each display **30**, sides **12** are horizontal on their exterior **14** and interior **15** surfaces. Instead of solid plexiglas sides with angled interior surfaces, separate panels **17** are provided on the interior to act as lenses. Here, the light from the underwater lights as depicted by arrow (b), passes straight through the sides **12** of the housing **10**, and the lens formed by the interior plexiglas panel **17** focuses the light on the rear of the displays panels **30**. While this embodiment will result in poorer refraction patterns, it will pass slightly more visible light. In addition, the lower portion **19** will be lighter, and may have to be weighted to provide proper ballast. This configuration does permit more room for arranging the interior components.

FIG. **4** is a detailed view illustrating the placement of one of the two solar cells **40** within the subject unit's housing **10**. Just as the interior surface **15** of the clear plexiglas is designed to focus underwater light on display **30**, the shape of the housing **10** is provided to focus the available sunlight onto the surface of the solar cell **40**. Rather than simply square off the housing **10**, a multi-faceted, slanted and wall **20** is provided. By providing multiple facets **21**, **22**, **23**, and by slanting the facets **21**, **22**, **23**, rather than providing a single, vertical wall, the device is better able to utilize sunlight from various angles.

In the preferred embodiment, three facets **21**, **22**, **23** are employed in a symmetric fashion as shown in this figure. However, other configurations can be employed, including a rounded end wall, to provide a similar effect. In any configuration, it is preferred that the interior surfaces of the plexiglass "face" the solar cell **40**—i.e., angled to be approximately perpendicular to an imaginary line drawn from the solar cell to the facet—to create the desired focusing effect.

Possible light paths are depicted in this figure as arrows (a) through (f). Because the solar cells **40** located at both ends of the subject device are configured similarly, the desired effect should occur at either end. This maximizes the charge capability for the internal battery system by allowing light to reach the solar cells **40** regardless of the orientation of the device in the swimming pool.

FIG. **5** is a block diagram of the unit's electronics. Temperature sensor **140** is preferably a thermistor or like device which provides a variable voltage in direct relation to the water temperature. Sensor board **80** processes this voltage, via any of a number of well-known analog to digital conversion techniques, into a digital signal that is applied to display driver **90**. One of the simplest and best known A to D conversion method involves feeding the analog signal to a series of comparators or operational amplifiers (not shown explicitly) which each provide either high or low output voltages depending upon whether the analog signal exceeds their individual threshold voltages. An encoder (not shown explicitly) reads which of the comparators' outputs are high or low and translates the combination into a digital signal of a recognizable code (i.e., binary). The display driver **90** further interprets the digital signal and supplies the appropriate stimuli to the seven-segment type displays **30**. Calibrating the comparators and the thermistor, and the subsequent wiring of the driver **90**, encoder, and displays **30** are simple matters of integrated circuit design, well known in the art.

Battery **70** provides the power need to operate the system. The battery **70** output voltage is applied directly to the two display units **30**, and is further applied to the voltage regulator circuit **160**, which furnishes a regulated voltage to all circuits other than the display units **30**. This voltage line is noted as V_{cc} in the diagram. The display units **30** are chosen so that they can run on unregulated voltage, which they do in this case in order to reduce the load on the small regulator **160**.

The battery **70** is charged via the solar cells **40**. The charge rate is controlled by the charging circuit **60** which is composed of normal voltage and current limiting circuits familiar to those skilled in the art. In addition to these normal circuits, a unique circuit is implemented to maintain the battery **70** at a safe temperature, which will greatly extend battery life.

FIG. **6** shows the circuitry utilized to monitor the battery temperature and control the charge cycle time. The battery compartment **155** contains two thermistors **160**, **170**. Thermistor **160** is a variable resistor having a resistance which varies inversely with temperature. Thermistor **170** is also a variable resistor, but its resistance is directly proportional to temperature. Therefore, as the temperature in the battery compartment **155** rises, the resistance of thermistor **160** will increase, while that of thermistor **170** will decrease. Capacitors **180**, **190** each have a constant capacitance. These capacitors **180**, **190** combine with the thermistors **160**, **170** to form a pair of RC circuits having variable time constants—one increasing and the other decreasing with temperature. The outputs of the two timing circuits are the timing inputs (t) of the monostable multivibrators **200**, **210**. The multivibrators **200**, **210** are connected to form a free running clocking circuit. The thermistors **160**, **170** and capacitors **180**, **190** are selected so as to have approximately equal time constants—therefore achieving 50% symmetry—at a temperature within the safe operating range of the battery **150**, generally about 25° C. The Q side output **220** of multivibrator **200** forms the active signal controlling the duty cycle of the charging system. As the temperature of the battery **150** increases, the duty cycle or pulse width of the output **220** decreases, slowing the charge rate, which in due time lowers the battery temperature. Conversely, as the battery temperature decreases, the charge rate will increase. Typical duty cycle rates for the recharging are illustrated in FIG. **7**. Thus, the system optimizes the charge rate. The rate is kept as high as possible while still protecting the battery **150** from the excessive temperatures that can occur during charge cycles, in the process maintaining the entire device at a safe temperature. This is important because it greatly extends the expected life of the battery **150** as well as keeping the unit from becoming too hot to be lifted by hand from the underside.

While the device has been described as a temperature meter, it should be understood that the device can incorporate a pH sensor and/or an oxidation reduction potential (ORP) sensor, utilizing the existing digital displays **30** to provide rotating readout of those parameters. In addition, since there is suitable electronics on board, a real-time clock can be included if desired. The addition of these items is readily understood by those skilled in the art. The switching circuitry employed for rotating the display **30** among the

various parameters is very similar to battery-charger timing switch but with constant (for practical purposes, not temperature-dependent) resistances, resulting in constant time periods.

Although multiple embodiments are described herein, it should be understood that the inventor intends for this invention to cover other pool gauges not described herein. For instance, the end wall **20** of the housing **10** could have a different number of facets, as long as they provided the desired focusing effect. Or alternate analog to digital conversion means could be employed, as many are known in the art.

What is claimed is:

1. A water monitoring device comprising:

a substantially transparent, buoyant housing having an upper portion and a lower portion;

a conditions sensor disposed primarily within said housing, extending partially from said housing, for measuring select physical conditions of said water;

a display disposed within said housing for displaying said conditions such that said conditions can be read through said housing;

wherein said lower portion of said housing is structured to refract light from outside said housing onto said display;

a communicator disposed within said housing for communicating said conditions from said conditions sensor to said display;

a rechargeable battery disposed within said housing for powering said device;

a solar panel disposed within said housing for recharging said battery;

said upper portion of said housing being structured to refract light from outside said housing onto said solar panel; and

wherein said device floats in said water with said upper portion substantially above water.

2. The device of claim **1** wherein:

said display is digital;

said display has a front side and a back side;

said conditions are displayed on said front side of said display;

said display is translucent such that said display can be illuminated from said back side;

said lower portion of said housing includes a lower interior face and a lower exterior face; and

said lower interior face is disposed at an angle with respect to said lower exterior face such that light passing from outside said housing through said lower exterior face is refracted as a result of said angle toward said back side of said display.

3. The device of claim **2** wherein:

said upper portion of said housing includes a facade and an end;

said front side of said display is visible through said facade;

said solar panel is disposed near said end; and

said end includes facets, said facets being disposed at angles to one another, said facets facing said solar panel such that light passing from outside said housing through said facets is refracted toward said solar panel.

4. The device of claim **3** wherein:

said conditions sensor includes a water temperature transducer for providing a voltage proportional to said water's temperature; and

said communicator includes a processor processing said voltage into a primary digital signal and a driver for driving said display according to said primary digital signal.

5. The device of claim **4** further comprising a control module for controlling said solar panel's rate of recharging said battery such that said battery's temperature remains within a predetermined range.

6. The device of claim **5** wherein said control module further comprises:

a battery temperature sensor for gauging said battery's temperature; and

a shifting mechanism for decreasing said rate of recharging whenever said battery's temperature exceeds a predetermined temperature and for increasing said rate of recharging whenever said battery's temperature is below said predetermined temperature.

7. The device of claim **6** further comprising:

a clock for keeping real time;

wherein said conditions sensor further comprises an acidity sensor for monitoring a pH level of said pool and an ORP sensor for monitoring an oxidation reduction potential of said pool;

wherein said processor processes said real time, said pH level, and said oxidation reduction potential into additional digital signals;

said driver additionally drives said display according to said additional digital signals.

8. The device of claim **7** further comprising a switching mechanism for alternating according to which among said digital signals said driver drives said display.

9. A water monitoring device comprising:

a substantially transparent, buoyant housing having an upper portion and a lower portion, said upper portion having a facade and an end;

a conditions sensor disposed primarily within said housing, extending partially from said housing, for measuring a select physical condition of said water;

a processor processing said condition into a corresponding digital signal;

a digital display, having a front side and a back side, disposed within said housing for displaying said condition on said front side such that said condition can be read through said facade of said upper portion of said housing;

said display being translucent such that said display can be illuminated from said back side;

a driver for driving said display according to said digital signal;

said lower portion of said housing including a lower interior face and a lower exterior face, said lower interior face being disposed at an angle with respect to said lower exterior face such that light passing from outside said housing through said lower exterior face is refracted as a result of said angle toward said back side of said display;

a rechargeable battery disposed within said housing for powering said device;

a solar panel disposed within said housing substantially near said end for recharging said battery;

said end of said upper portion of said housing including facets, said facets being disposed at angles to one another, said facets facing said solar panel such that light passing from outside said housing through said facets is refracted toward said solar panel; and

wherein said device floats in said water with said upper portion substantially above water.

10. The device of claim **9** wherein:

said conditions sensor includes a water temperature transducer for providing a voltage proportional to said water's temperature; and

said corresponding digital signal includes a primary discrete digital signal processed by said processor from said voltage.

11. The device of claim **9** further comprising a control module for controlling said solar panel's rate of recharging said battery such that said battery's temperature remains within a predetermined range.

12. The device of claim **11** wherein said control module further comprises:

a battery temperature sensor for gauging said battery's temperature; and

a shifting mechanism for decreasing said rate of recharging whenever said battery's temperature exceeds a predetermined temperature and for increasing said rate of recharging whenever said battery's temperature is below said predetermined temperature.

13. The device of claim **12** further comprising:

a clock for keeping real time;

said conditions sensor further comprising an acidity sensor for monitoring a pH level of said pool and an ORP sensor for monitoring an oxidation reduction potential of said pool; and

said corresponding digital signal further including a set of additional discrete digital signals as a result of said processor's processing said real time, said pH level, and said oxidation reduction potential.

14. The device of claim **13** further comprising a switching mechanism for alternating according to which among said discrete digital signals said driver drives said display.

15. A water monitoring device comprising:

a transparent, buoyant housing having an upper portion and a lower portion, said upper portion having a facade and an end;

a water temperature transducer for providing a voltage proportional to said water's temperature;

an acidity sensor for monitoring a pH level of said pool;

an ORP sensor for monitoring an oxidation reduction potential of said pool;

a clock for keeping real time;

a processor for processing said voltage, said pH level, said oxidation reduction potential, and said time into corresponding digital signals;

a digital display having a front side and a back side, said display disposed within said housing for alternately displaying said water's temperature, said pH level, said oxidation reduction potential, and said time on said front side such that said display can be read through said facade;

said display being translucent such that said display can be illuminated from said back side;

a driver for driving said display according to said digital signals;

a switching mechanism for alternating according to which among said digital signals said driver drives said display;

said lower portion of said housing including a lower interior face and a lower exterior face, said lower interior face being disposed at an angle with respect to said lower exterior face such that light passing from outside said housing through said lower exterior face is refracted as a result of said angle toward said back side of said display;

a rechargeable battery disposed within said housing for powering said device;

a solar panel disposed within said housing substantially near said end for recharging said battery;

a battery temperature sensor for gauging said battery's temperature;

a control module for decreasing said rate of recharging whenever said battery's temperature exceeds a predetermined temperature and for increasing said rate of recharging whenever said battery's temperature is below said predetermined temperature;

said end of said upper portion of said housing including facets, said facets being disposed at angles to one another, said facets facing said solar panel such that light passing from outside said housing through said facets is refracted toward said solar panel; and

wherein said device floats in said water with said upper portion substantially above water.

* * * * *

IE3

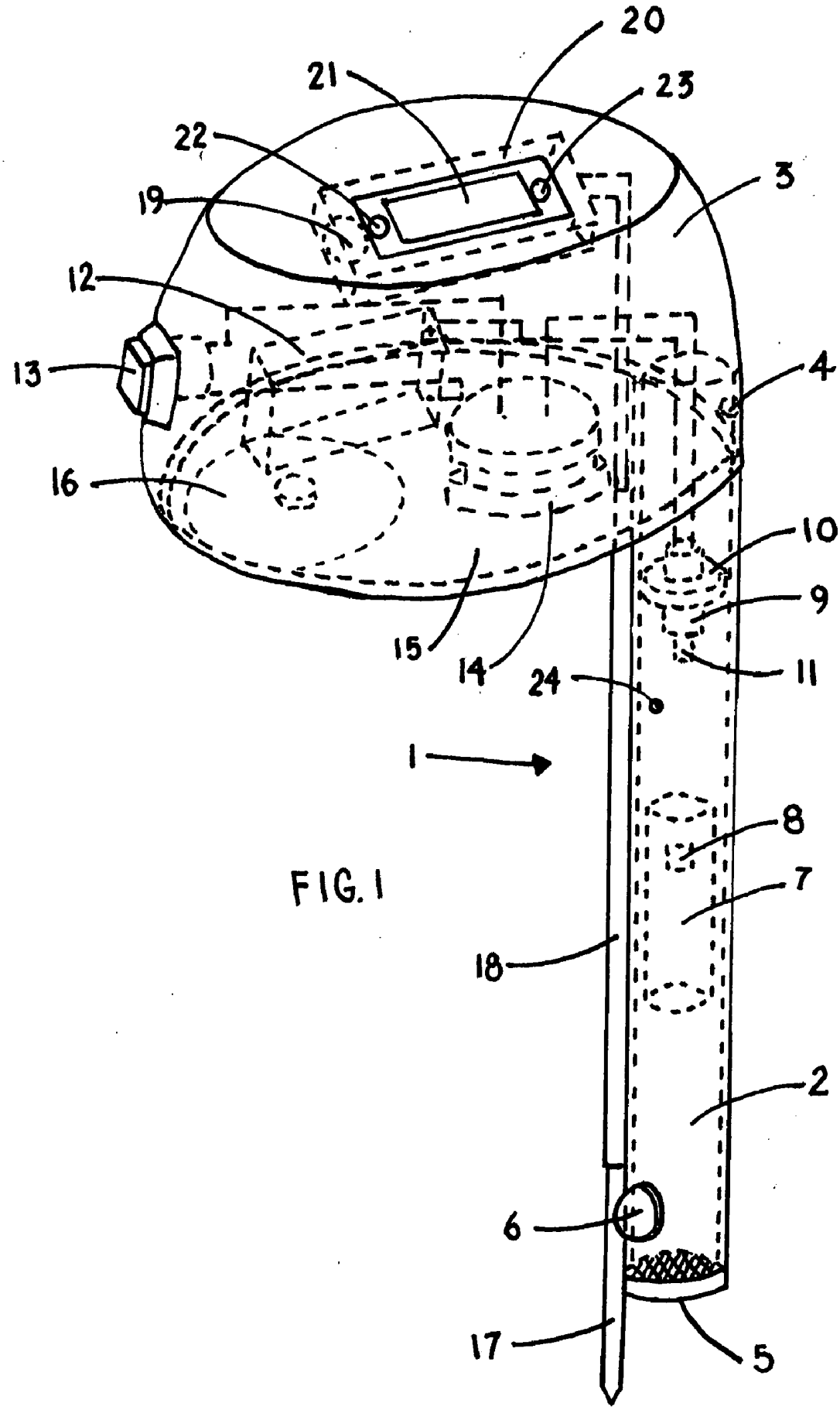


FIG. 1

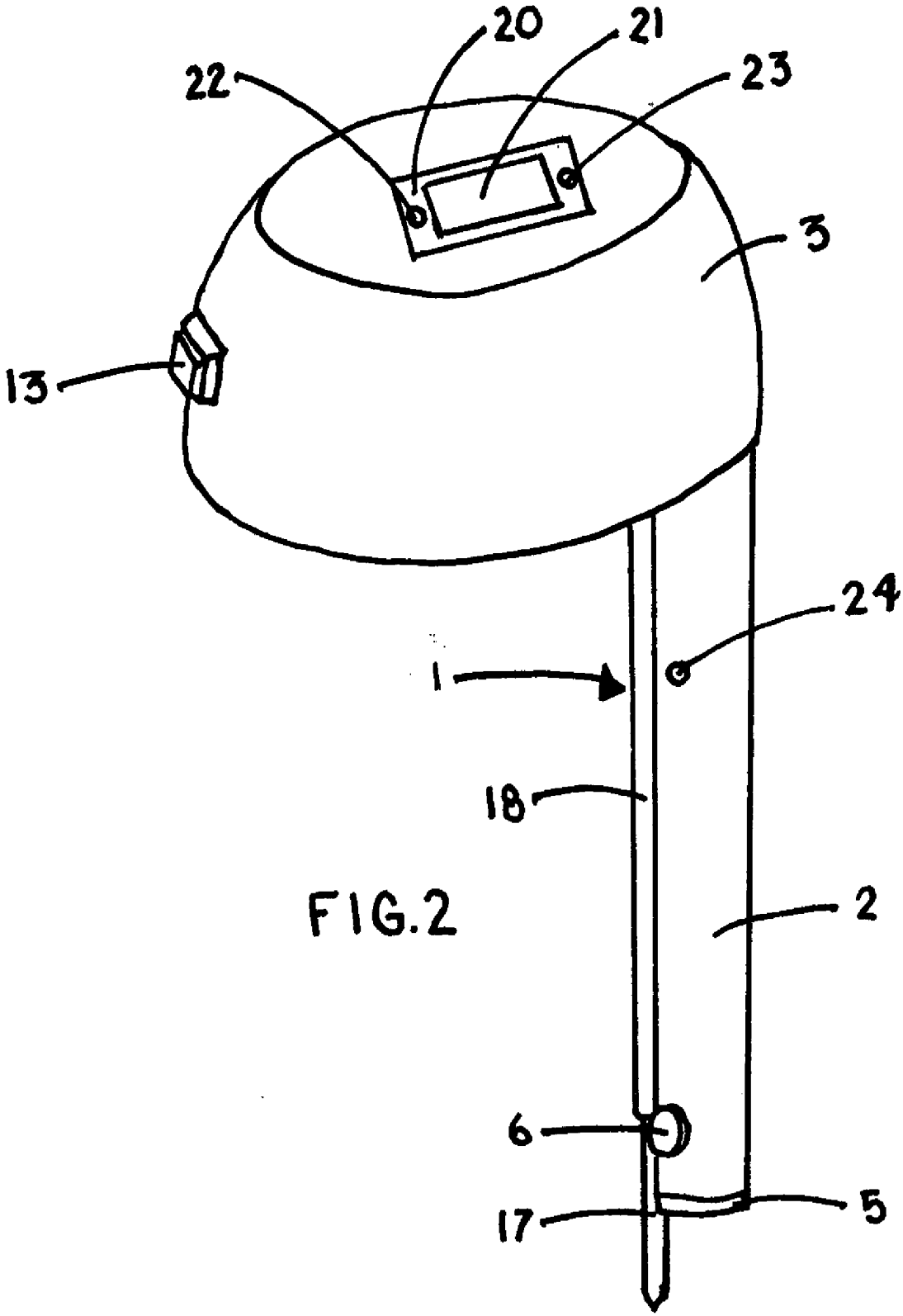


FIG.2

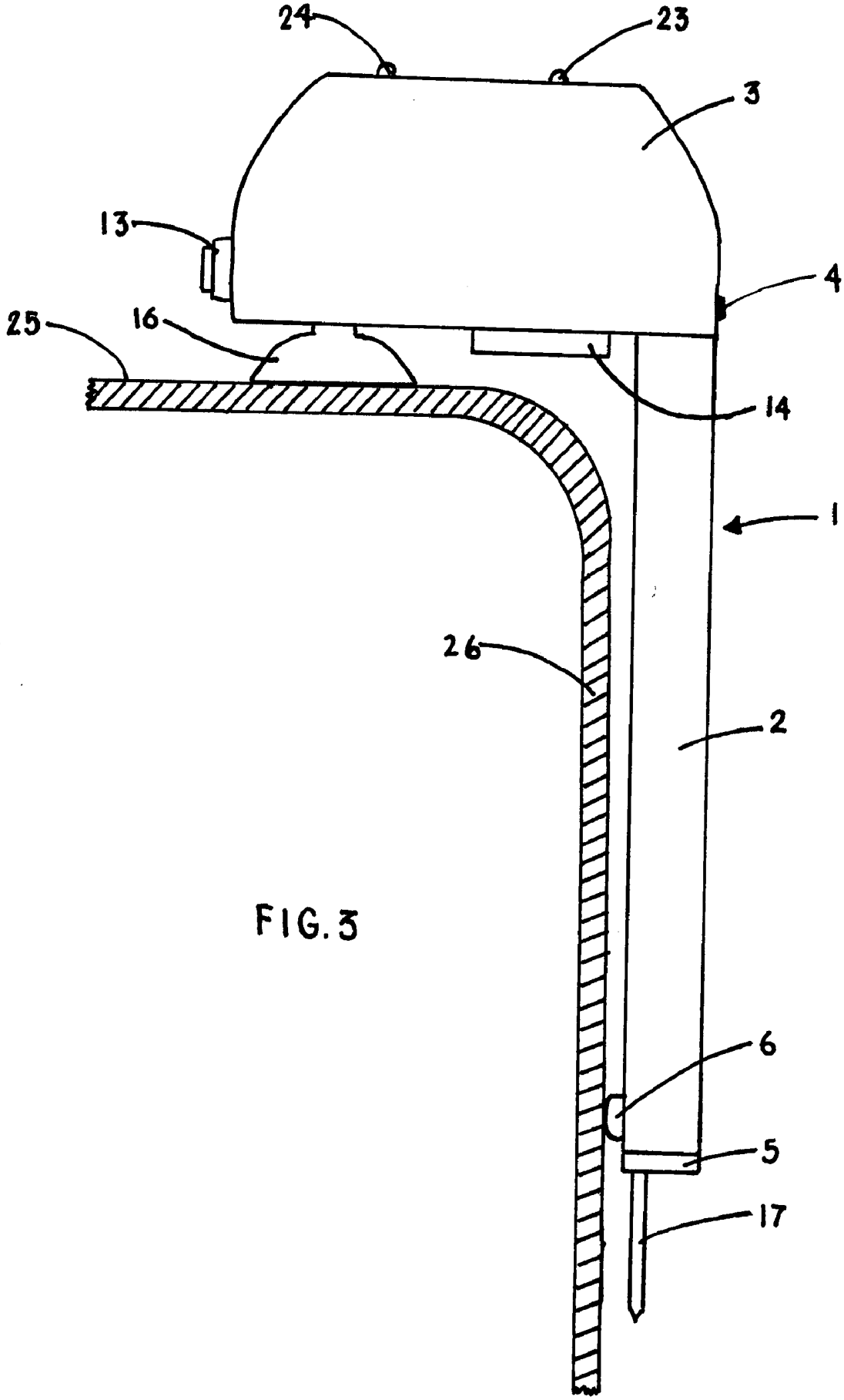


FIG. 3

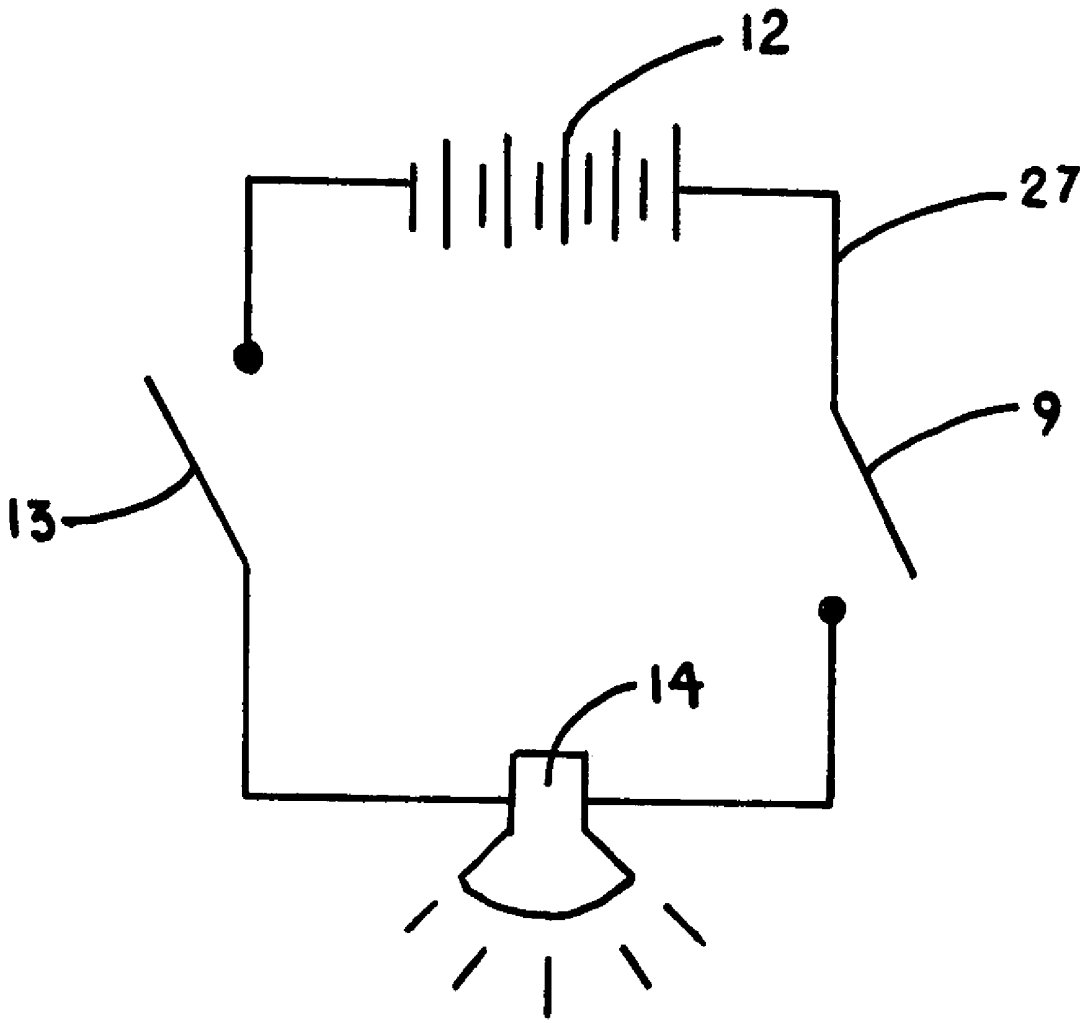


FIG. 4

WATER LEVEL & TEMPERATURE INDICATOR

[0001] I claim benefit of provisional application 61/055, 825 filed on May 23, 2008

DETAILED DESCRIPTION OF THE INVENTION

[0002] Referring now to the views of the drawing, it will be noted that the water level and temperature indicating device **1** comprises a hood unit **3** carrying a laterally extended cylindrical tube member **2** at one end. Both units are primarily made of a suitable metal or plastic material and are connected together by suitable fasteners **4** or a spot weld **4**.

[0003] Member **2** is hollow and is open at the bottom end with the exception of a removable screen unit **5** which is press fitted into the member **2**. The screen unit is comprised of a screen of suitable material imbedded in a flexible plastic or rubber casting. A rubber bumper **6** is fixed to the lower side of member **2** with double sided tape or other suitable adhesive. Member **2** contains a cylindrically shaped float unit **7** which is primarily made from Styrofoam or cork. This float contains a small weight **8** made of stainless steel or suitable material. Member **2** also contains a modified, push on switch **9**. This switch **9** is mounted inside the upper portion of member **2** using a press fitted rubber seal **10**. The modification of the switch **9** includes the removal of the push button release spring of a push on switch. This modification allows the switch button **11** to be depressed with very little pressure, thus allowing a much smaller than usually required float unit **7** to fully depress the switch. The switch button **11** returns to its open position by the force of gravity and the weight of the switch button **11** itself, when pressure from the float unit **7** is released. The switch **9** is connected by insulated wires to an electrical circuit FIG. **4** comprised of a detachable battery **12**, push on/off switch **13**, audible alarm device **14**, modified push on switch **9** and suitable gauge of insulated wire **27**.

[0004] At the end of the hood unit **3**, opposite member **2** is a push on/off switch **13** mounted through a hole of desired proportion. This switch **13** is to open or close the audible alarm device **14** electrical circuit FIG. **4** and will as a result enable or disable the water level indication portion of this invention.

[0005] The open bottom side of the hood unit **3** is fitted with a plastic cover plate **15**. This cover plate **15** is inserted into the bottom of the hood unit **3** by a press fit. Attached to the cover plate is a suction cup **16** and the audible alarm device **14**. The suction cup **16** is attached to the cover plate **15** by press fit into a hole in the plate **15** of desired proportion. The audible alarm device **14** is mounted through a hole in the plate **15** of desired proportion and is secured by a suitable fastener.

[0006] A stainless steel temperature probe **17** runs parallel to member **2** and is fixed to member **2** with a suitable fastener. The probe **17** is covered in rubber heat shrink tubing **18** with the exception of the bottom end which is exposed for quick accurate response to temperature variation. The probe **17** is connected by two wires to a battery **19** operated digital thermometer device **20** that is mounted inside the hood unit **3** at an opening at the top of the hood unit **3**. This digital thermometer device **20** is secured to the hood **3** by epoxy, silicone or hot glue. The said thermometer device **20** has a LCD readout **21** that indicates temperature values in Celsius or Fahrenheit degrees. On/off **22** and Fahrenheit/Celsius **23** selection buttons on this thermometer device **20** have control of the thermometer device **20** only.

[0007] In operation the device **1** as shown in FIG. **3** is removably attached to the top ledge **25** of a bathtub by the included suction cup **16** with member **2** and the thermometer probe **17** depending into the tub. A rubber bumper **6** located on the bottom side of member **2** bears member **2** against the tub wall **26**. As the tub is filled, the water level rises and enters the bottom end of member **2** through the screen **5**. As the water rises it raises the float **7** and displaces air in member **2**. The displaced air simultaneously escapes through the orifice **24** of member **2**. Continued filling of the tub will cause the float **7** to rise in member **2** ultimately reaching switch **9** level. As the float **7** applies pressure to the switch button **11**, it raises up the switch button **11** which closes the electrical circuit FIG. **4** of the water level indicating portion of the invention and sounds an alarm **14**. This indicates that the preset desired water level is achieved. The alarm **14** will sound until either the on/off switch **13** is depressed, disabling the alarm circuit FIG. **4** or the water level is lowered causing the float **7** level to drop thus relieving switch button **11** pressure and opening the alarm circuit FIG. **4**. The float **7** is weighted with a stainless steel weight **8** in order to assist it's descent to the bottom of member **2** when water level in member **2** recedes. The weighting of the float **7** also allows closer float **7** clearances in member **2** which minimizes the necessary member **2** inside diameter. The weighted float **7** also assists the descent of the float when member **2** is not completely vertical. Using different lengths of floats **7** will dictate the water level necessary to sound the alarm thus the float **7** is interchangeable to incorporate a variety of float **7** lengths. Removal of the screen **5** of member **2** allows necessary float **7** changes to achieve the desired preset water level. The thermometer probe **17** indicates air temperature while not in contact with the water and provides water temperature when it contacts the water.

[0008] While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions shown herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims. It should be understood that indicator **1** may be used in other places, such as a kitchen sink, laundry sink, hot tub, pool, or pond. Indicator **1** may be used in completely diverse areas such as a sump pit, reservoir or even the bilge of a boat and be used for liquids other than water. Indicator **1** may also include the use of a transmitter in the alarm electrical circuit to send a signal to a receiver which will energize a servo to close a water supply valve for the bathtub. This transmitter may also activate a mobile audible alarm device such as a pager. It is intended that all matter contained in the foregoing description and shown in the accompanying drawings shall be determined as illustrative only. It is to be understood that features of the digital thermometer **20** are limited to the brand or model of thermometer device used in the construction of the embodiments of my invention.

BACKGROUND OF THE INVENTION

[0009] This invention relates to a signal alarm for use to audibly indicate desired preset water level when filling a bathtub with water and monitoring water or air temperature. The device is removably attached to the bathtub ledge with a suction cup. When filling a tub with water one will some times be distracted and forget about the water flowing. This can be

disastrous especially when the bathtub is on an upper floor in the building. Most bathtubs have overflows but in most cases the overflows have limited capabilities. Usually these overflows can't disperse the amount of water supplied by the faucet quick enough to prevent overflow. It is also wasteful to have the water flowing longer than needed not only for the waste of water but also for the wasted energy to heat the water.

[0010] It is, therefore, an object of this invention to sound an alarm when the water in a bathtub being filled, has reached it's desired preset level thus preventing overflow and waste. Another object of this invention is to sound an alarm in the case of a tub filling with sewage due to sewer backup.

[0011] The probe type digital thermometer portion of this invention is a great aid in safety and health. Many medical circumstances call for specific water temperature when bathing. Infants, small children and pets should not exceed specific water temperatures while bathing.

[0012] It is, therefore, an objective of this invention to provide accurate indication of liquid and air temperature for reasons of health and safety of both people and animals.

BRIEF SUMMARY OF THE INVENTION

[0013] This water level and temperature indicating device is much more desirable both aesthetically and functionally than any previous invention of similar scope. With it's bathtub ledge mounting and it's slender float chamber, this device is much less invasive to the bathtub than other previous devices. A smaller diameter float chamber than normally required is achieved by incorporating a weighted float. A weighted float is used to aid float descent within the float chamber and it also facilitates much closer float to inner float chamber clearances. The use of a modified push on switch in the float chamber requires very little float pressure to close the alarm electrical circuit thus allowing the use of a smaller than normally required float. Using floats of different lengths will determine the water level necessary to raise the float within the float chamber to sound the alarm. A long float will require a lower water level to sound the alarm than a short float. The use of a removable screen unit at the bottom of the float chamber allows quick and easy float change. Removal of the screen unit also facilitates the cleaning of the inner float chamber. The inclusion of a probe type digital thermometer device dramatically broadens the scope of this invention in comparison with previous inventions of similar scope and provides significant health and safety advantages.

BRIEF DESCRIPTION OF DRAWINGS

[0014] FIG. **1** is a perspective view of my water level and temperature indicator which shows the float, switch, battery, suction cup, audible alarm device, bottom cover plate and the electrical wires in phantom lines.

[0015] FIG. **2** is a perspective view of my water level and temperature indicator.

[0016] FIG. **3** is a plain elevation side view taken from the side of the preferred embodiment mounted on a bathtub ledge.

[0017] FIG. **4** is a schematic of the electrical circuit related to the water level indicator portion of the invention

Having thus described my invention with the foregoing description and drawings, what I claim as new, and desire to secure by United States Letters Patent is:

1. A water level and temperature indicating device useful in a bathtub or the like comprising of a member carrying the means to fasten the indicator to the tub ledge, an elongated float chamber depending from the member, a removable screen at the bottom end of the float chamber, a rubber bumper fixed near the bottom of the side of the float chamber, an orifice on the upper side of the float chamber just below switch level, a temperature probe depending from the member parallel to the float chamber, a digital thermometer devise with LCD readout and a battery and function controls, a weighted float within the float chamber, a push on/gravity off switch mounted with a rubber seal within the upper portion of the float chamber, a push on/off switch, an electrical circuit interconnecting the alarm device and battery and being provided with two switches and a receptacle, so that when the tub is filled with liquid the float will rise within the said float chamber and when the float reaches the switch, it depresses the switch button thus closing the electrical circuit of the water level indicator portion of the said device, the digital thermometer portion of the said device will display air temperature values until it makes contact with liquid.

2. The indicator of claim **1**, wherein said device is mounted on the tub ledge with suction cup.

3. The indicator of claim **1**, wherein said device bears on a rubber bumper against the tub wall.

4. The indicator of claim **3**, wherein said rubber bumper is adhered to the lower side of the float chamber.

5. The indicator of claim **1**, wherein said float is weighted with small weight of desired proportion and desired material.

6. The indicator of claim **5**, wherein said float is interchangeable with floats of different lengths for adjustability of desired preset water levels.

7. The indicator of claim **1**, wherein said float chamber is fitted with a removable screen unit.

8. The indicator of claim **7**, wherein said screen unit is installed and removed by press fit, allowing float change and cleaning.

9. The indicator of claim **1**, wherein said modified push on switch is mounted in the upper section of the float chamber.

10. The indicator of claim **9**, wherein said switch modification includes the removal of the switch button release spring.

11. The indicator of claim **1**, wherein said inclusion of a digital thermometer device with LCD display comprising of a battery operated digital thermometer devise, insulated wires and a permanently fixed temperature probe.

* * * * *

IE4

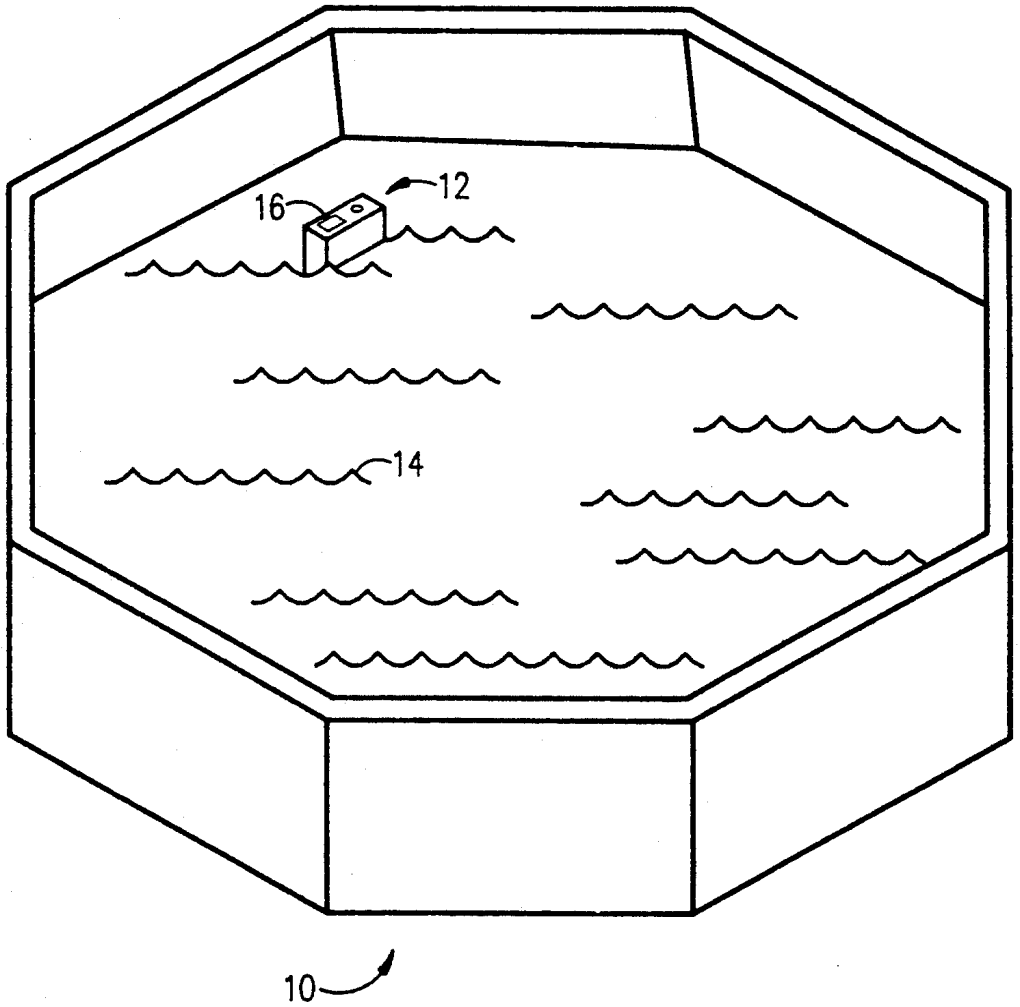
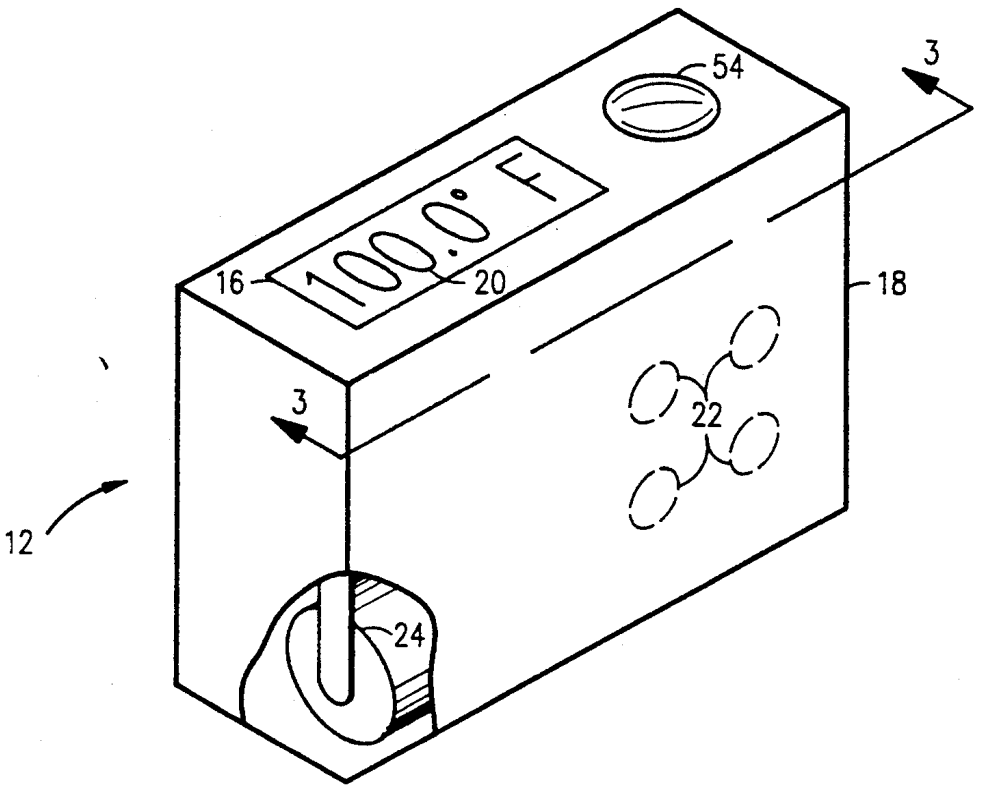


FIG. 1.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100.0° F
16
20
18
3
22
12
24

FIG. 2.

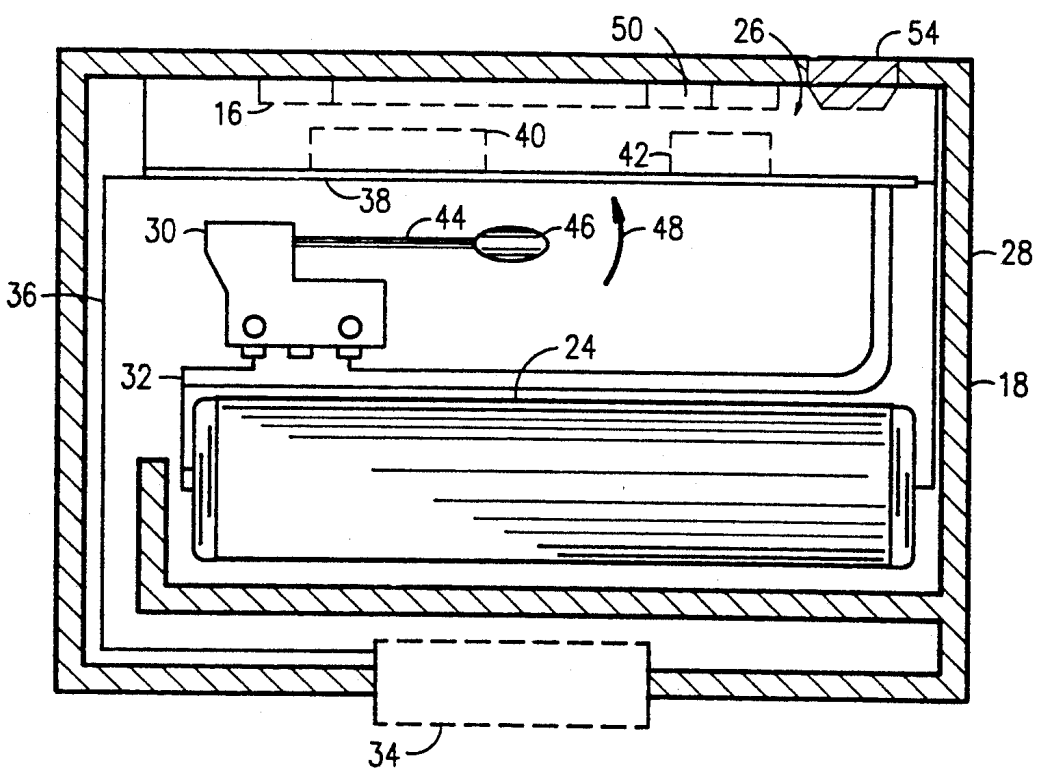
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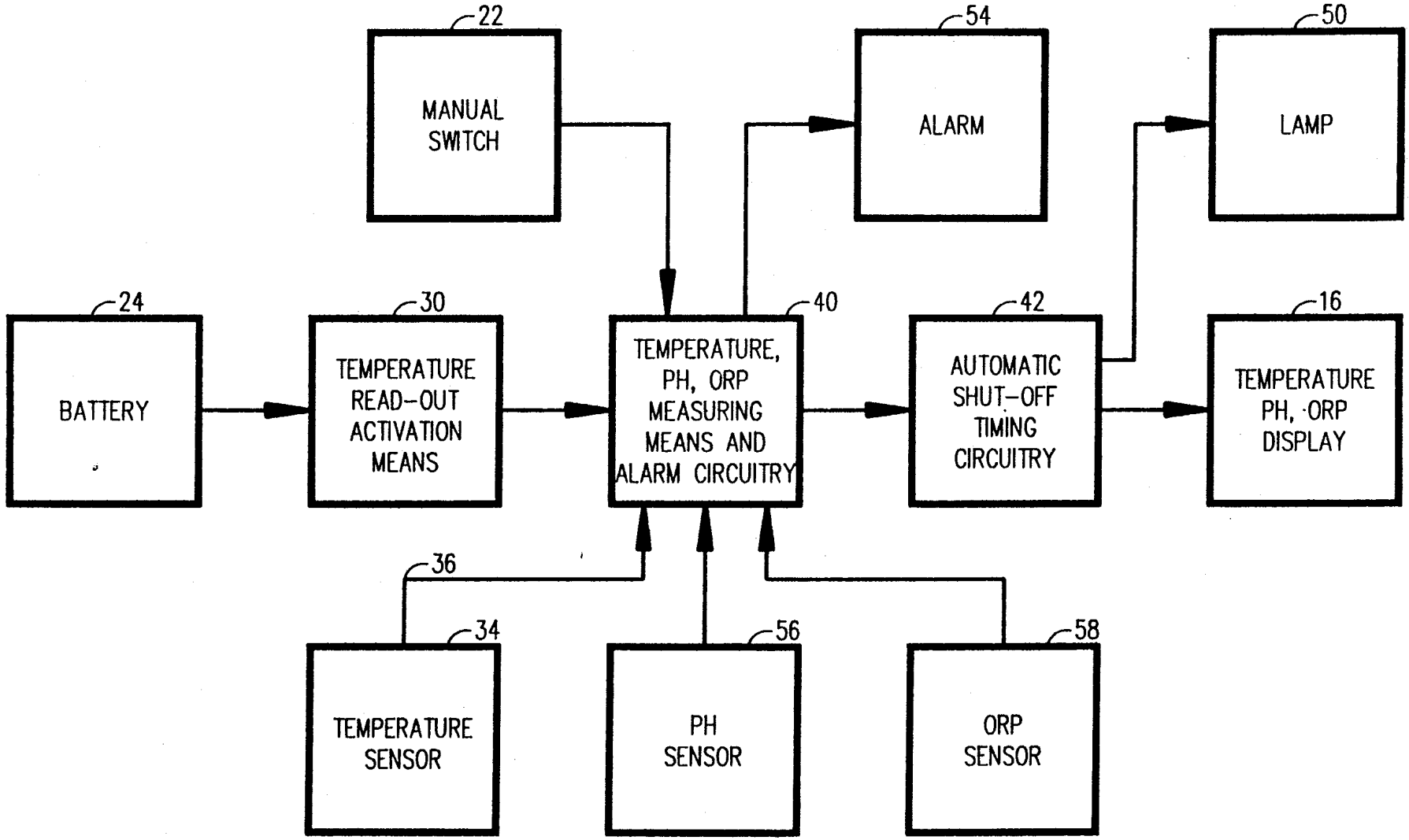
FIG. 3.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MANUAL SWITCH
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ALARM
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LAMP
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BATTERY
30
TEMPERATURE READ-OUT ACTIVATION MEANS
40
TEMPERATURE, PH, ORP MEASURING MEANS AND ALARM CIRCUITRY
42
AUTOMATIC SHUT-OFF TIMING CIRCUITRY
16
TEMPERATURE PH, ORP DISPLAY
36
34
TEMPERATURE SENSOR
56
PH SENSOR
58
ORP SENSOR

FIG. 4.

DIGITAL SPA THERMOMETER

CROSS-REFERENCE TO OTHER APPLICATIONS

This application is derived from application Ser. No. 346,366, filed Apr. 27, 1989, now abandoned, which in turn was a continuation of parent application Ser. No. 191,603, filed May 9, 1988, now abandoned.

BACKGROUND ART

This invention relates to a solid state digital thermometer having a number of additional useful features for use in a spa, hot tub, bathtub or swimming pool. Spas are typically utilized out-of-doors away from readily available clocks or time pieces. Because spas are typically operated and used at an elevated temperature, it is advantageous to have readily available a thermometer which enables users to determine the water temperature of the spa.

The usefulness of a floating spa thermometer is disclosed in, for instance, U.S. Pat. No. 4,503,563 in which a combination light, temperature probe and radio is adapted to float within a spa. A handle enables it to be used as a portable lantern or radio. A somewhat more primitive device is disclosed in U.S. Pat. No. 4,435,095, wherein a glass mercury thermometer is provided to measure the temperature of a hot tub.

Digital display thermometers are well-known. For example, U.S. Pat. No. 4,444,517 discloses an electronic clinical thermometer having a magnetic reed switch requiring that, once activated, the thermometer must be placed in a magnetic field to break the contact to the battery. The device is watertight and is not provided with illumination means for use at night. Also, U.S. Pat. No. 4,601,589 is an electric thermometer powered by a solar cell having a digital display of temperature.

Lastly, a pair of swimming pool alarms are disclosed in U.S. Pat. Nos. 3,969,712 and 3,054,096. Both devices utilize motion-sensitive switches responsive to waves in the pool, setting off alarms to indicate that, for instance, a child has fallen into the pool.

SUMMARY OF THE INVENTION

The apparatus of the present invention is intended primarily as a thermometer for measuring the temperature of spas, hot tubs and pools. The device is adapted to float on the water surface and to indicate the temperature either automatically responsive to activation of a motion-sensitive switch, or manually responsive to a manual switch. The device is enclosed in a buoyant, watertight housing which may be in the form either of clear plastic or provided with various colors, scenes or commercial advertising. A temperature probe extending through the buoyant housing is adapted to measure the water temperature and convey such measurement to a temperature on a digital display screen. The device is battery operated, with a majority of the weight of the apparatus below the centerline of the apparatus so as to maintain proper orientation of the device with the digital display unit in an "up" position.

The movement sensitive switch may be any type of switch which will become activated upon a rapid movement of or shock to the apparatus by one wishing to observe one or more of its functions. Alternatively, a manually activated switch may be provided to activate the temperature probe without resort to the movement sensitive switch.

In addition to the temperature probe, the device may be provided with additional features, such as a light source for viewing in darkness, time/date means for indication in the digital display means, an alarm to indicate passage of a predetermined period of time, and means to emit musical tones when one of the other functions is activated. Each of these additional features may be provided with a manual switch for activation when desired.

The device is provided with timers such that upon activation of any of the features, they will automatically be turned off after a predetermined time lapse so as to conserve battery power. Additionally, the motion-sensitive switch may be provided with means to continue illumination of the appropriate temperature beyond when the motion-sensitive switch has been opened by a movement opposite that which closed the switch initially.

Therefore, it is an object of the present invention to provide a floating watertight thermometer for measuring water temperature. Temperature of the water measured by this device is displayed in a digital display located on the upper surface of the device.

It is a further object of this invention to provide means to turn on and turn off the thermometer, and various other features, either automatically through motion-sensitive switches, or manually through manually activated switches. Other objects and advantages of this invention will become apparent after consideration of the following drawings and descriptions.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an isometric view of the apparatus of the present invention in a spa.

FIG. **2** is a close-up view of the apparatus of FIG. **1**.

FIG. **3** is a sectional view taken along lines **3—3** of FIG. **2**.

FIG. **4** is a functional block diagram which shows the various electrical interconnections between the electrical components which may be incorporated in the structure of FIGS. **2** and **3**.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, FIG. **1** illustrates a spa or hot tub, generally designated **10** within which is floating the thermometer **12** of the present invention in a body of water **14**. As illustrated, the thermometer of the present invention floats in an upright position with a digital display **16** facing upwardly for easy viewing.

More specifically, FIG. **2** illustrates the apparatus of the present invention in greater detail. As illustrated, the apparatus comprises an exterior housing **18**, which must be watertight in order to protect the internal components and circuitry of the apparatus. The digital display window **16** displays a number of numerals of letters **20** indicating the temperature, time, date or other useful information. The digital numerals and/or letters are preferably provided in the form of a liquid crystal display (LCD), but may other types of displays which are well-known to those skilled in this art. The housing **18** may be provided with a number of manual switch means **22** to manually control or activate the display of a number of functions, as set forth in greater detail below.

Because the housing **18** is airtight, it will in most cases float upon the surface of a body of water within spa **10**. However, additional buoyancy may be added by lining or packing the interior of housing **18** with buoyant materials. The housing **18** may be encased in a translucent plastic, or the housing **18** may be itself either a translucent or colored material. Art work may be provided on the exterior of housing **18** (such as tropical beach scenes or advertising) before encasing in translucent materials.

As illustrated, the device is provided with one or more batteries **24** which provide power for the various electronic functions of the device, as well as illumination of the display **16**. It is contemplated that the battery **24** will be encased in the housing **18** without means for replacing the battery after its useful life has expired. Any means to access the battery for replacement increases the risk of leaks into the interior of housing **18**. The battery is preferably a miniaturized lithium-style long life battery commonly found in watches, hearing aids, etc. Because the features of the present invention are only activated periodically, it is anticipated that the useful life of such batteries in the instant invention will be at least 2 to 4 years. Alternatively, means may be provided to recharge the batteries, if the batteries so permit. If conventional alkaline batteries (as depicted in FIG. **2**) are utilized, an access port through housing **18** may be desirable in order to replace spent batteries. Obviously, such port (not shown in the drawings) must be watertight to ensure no leakage of the housing. Such batteries may be necessary to maintain proper orientation of the apparatus.

FIG. **3** illustrates the device of the present invention in greater detail. As illustrated, the battery **24** is interconnected to thermometer **26** with wire **28**, and also to the microswitch **30** by wire **32**. A temperature probe **34** is secured in or through the housing **18** so as to be in contact with the water upon which the device floats. The temperature probe **34** is interconnected to the thermometer **26** by wire **36**. The battery **24**, temperature probe **34**, thermometer **26** and microswitch **30** are all interconnected by a conventional circuitry assembly **38**. Additionally, a temperature conversion assembly **40** and timing circuitry **42** are mounted to the circuit assembly **38**.

In operation, the apparatus of the present invention is typically in an "off" condition due to the fact that the microswitch **30** is a normally "open" switch. As illustrated, the microswitch **30** is a weighted microswitch having an arm **44** with a weight **46** on the end thereof. One of the contact points (not shown) of switch **30** is affixed to the end of arm **44** to be normally in the position illustrated in FIG. **3**. A shock or rapid movement of the apparatus causing the weight **46** to move upwardly in the direction of arrow **48** closes the contact points within switch **30**, thereby providing power from battery **24** to the various electrical components of the device. When the microswitch **30** is closed and the device is activated, the temperature conversion assembly **40** is activated, converting the temperature reading from thermometer **26** to the digital number displayed in display **16**. The LCD display **16** is illuminated by the subminiature lamp **50**. The device may be programmed such that while the temperature conversion is in progress, the numerals displayed in the display **16** will flash; when the conversion is complete, the numerals **20** are .on continuously, indicating the current water temperature. After a predetermined period of time, the timing element **42** will complete its countdown sequence and turn off the LCD display **16** and subminiature lamp **50**.

As illustrated in FIG. **3**, the battery **24** comprises a substantial portion of the weight of apparatus **12**, and is located in the lower portion of housing **18**. Therefore, the center of mass of the apparatus **12** is below the centerline of the apparatus, thereby insuring that the digital display **16** will remain in an upright position for viewing. When a relatively small watch-type battery is utilized herein, additional weights may be placed in the bottom of the device to ensure proper weight distribution to maintain the digital display up.

Referring now to FIG. **4**, this figure has been added herewith in order to illustrate the functional relationships between the various components shown in FIGS. **2** and **3** above. In addition, the new matter added by way of FIG. **4** relates to the PH sensing means **56** and to the oxidation reduction potential (ORP) sensing means **58** as will be described in further detail below. However, apart from the newly added functional elements of the PH sensing means **56** and the ORP sensing means **58**, the remaining functional block diagram elements shown in FIG. **4** find a full and complete basis in the above description of FIGS. **2** and **3**. These functional elements have been added by way of FIG. **4** of the present application in order to provide the reader with an easier understanding of the particular electrical connections which are made between all of the components shown in FIG. **4** in order to allow the novel circuit operation to take place in a manner to be described.

Referring again to FIG. **4**, it will be seen that the battery **24** is connected to provide power to a temperature read out activation means **30**, which in FIG. **3** is embodied in the microswitch as indicated. The temperature read out activation means **30** is in turn connected to drive and provide an input signal to temperature, PH, ORP measuring means and alarm circuitry **41**. This stage **41** is in turn connected to drive automatic shut-off timing circuitry **43**, which as previously indicated is preferably a selected timer having a predetermined time-out period. The automatic shut-off timing circuitry **43** is connected to temperature, PH and ORP display means **16** which is embodied in the form of a digital read out as previously indicated in FIG. **2** above. The automatic shut-off timing circuitry **43** is further connected to a lamp **50** which is constructed adjacent to the temperature, PH and ORP display means **16** in order to provide adequate lighting for the read out display means **16**.

The temperature, PH and ORP measuring means and alarm circuitry **40** is further connected to provide an output signal to an alarm means **54** which, as indicated in FIGS. **2** and **3** above, is preferably an audio alarm of any desired type. The temperature, PH and ORP measuring means and alarm circuitry **41** is further connected to manual switching means **22**, which in the embodiment of FIGS. **2** and **3** above consists of a plurality of circular shaped manually operated membranes located on the outer walls of the device housing.

The system of FIG. **4** further includes three sensors in the form of temperature sensing means **34**, PH sensing means **6**, and oxidation-reduction potential (ORP) sensing means **58** which are all connected as shown to drive and provide input signals to the temperature, PH, ORP measuring means and alarm circuitry **41**. The temperature sensing means **34** has been previously described in FIG. **3** above as preferably being a temperature probe

having the same reference numeral **34** as shown and being connected by way of an electrical connection **36** to the integrated circuit **40** in FIG. **3**. The reference **41** is also used in FIG. **4** to identify the temperature, PH, ORP measuring means and alarm circuitry previously described.

It will be appreciated by those skilled in the art that the system of FIG. **4** is extremely versatile and lends itself to the connection of a plurality of diverse sensors such as the temperature, PH and ORP sensors **34**, **56**, and **58**, and the output signals from these diverse sensors **34**, **56**, and **8** may be parallel processed in the previously described temperature, PH and ORP measuring stage **41** by the use, of, for example, a selected microprocessor for the stage **41** which is capable of simultaneously parallel processing output signals from these three sensor stages **34**, **56**, and **58**. Both PH sensing and oxidation reduction potential sensing are generally well known in the art and various types of both PH or ORP sensors are available for purchase on the commercial market. For example, PH and ORP measuring sensors and instruments have been described in an article in *Pool and Spa News* entitled "Test Kits Marketplace", Vol. 29, No. 4, Feb. 26, 1990 at pages 121-129, and also in data sheets published by the Cole-Parmer Instrument Company of Chicago, Ill. in an article entitled "Instruments For Research, Industry and Education", at pages 487 to 489 and pages 522 to 523. In addition, PH and ORP sensing systems and devices have also been described by Jack Steininger and Wes Kelly of the Aquasense Corporation of Santa Barbara, Calif. in an article entitled "Test Swimming Pool or Spa With One Finger" and published in the *Dealer News* at page 20 in October 1986. All three of the above publications are incorporated herein by reference.

The device of the present invention may be provided with additional electronic circuitry to indicate the time and/or date, and a timed alarm function and musical notes. An internal clock may be provided so that when activated by membrane switch **22**, the appropriate time and/or date may be displayed in the digital display **16**. An alarm function may be provided with the timing circuitry. By setting a predetermined period of time in the timing circuitry, the alarm **54** will sound to indicate the expiration of the desired timer period. Such feature may be advantageous to ensure that a user of a relatively hot spa does not become overheated by exposure over too great a time. Additionally, a sound-generating apparatus, programmed to play musical notes, may be incorporated into various functions of the apparatus. For instance, the musical notes may be played while temperature conversion unit is activated, or the musical notes may be played at any time the device is "on", to indicate that the device is drawing power from its internal battery.

The device of the present invention as illustrated in the figures, is a motion-sensitive apparatus responsive to waves within the spa **10** or to intentionally-inflicted shock of the apparatus. The timing circuitry ensures that excess battery drain does not occur and that the device is automatically turned off after a predetermined time period.

While a preferred embodiment of the invention has been disclosed, various modes of carrying out the principles disclosed herein are contemplated as being within the scope of the following claims. For example, it is not necessary that the temperature read out activation means **30** be implemented in the form of an acceleration activated microswitch having a movable mass **46** as shown in FIG. **3**. Instead, the temperature read out activation means **30** as shown in FIG. **4** above may, for example, be implemented in the form of a detector operative to respond to an infrared or radio signal generated in the vicinity of a pool or spa merely by the turning on of a switch or the like. Alternatively, the digital spa thermometer described above may be provided with a small antenna on its outer housing, which is in turn coupled to a slightly detuned LC resonant circuit and accompanying detector and amplifier. Using such circuitry, a person coming within a predetermined distance of the antenna will, by body capacitance, change the lumped capacitance of the antenna and thereby tuning the LC resonant circuit to resonance and enabling the output signal passed therethrough and detected to be used as an activating signal output from the stage **30** shown in FIG. **4**. Such a detected and amplified signal could in turn be used to activate the temperature, PH, ORP measuring means and alarm circuitry **41** as previously described. Finally, it is not essential that the digital display **16** shown in FIG. **2** of the drawings be mounted on a single slanted surface of the device **12**. Instead, this display **16** may, for example, be shown on both of two adjacent V-shaped slanting surfaces, or even on four adjacent and orthogonal surfaces which face, respectively, four orthogonal directions so that the digital read out number **20** of the spa or pool temperature may be easily seen by a person positioned at any location around the periphery of the pool or spa into which the hand held device **12** has been introduced. Therefore, it is to be understood that the above and other design modifications are clearly within the scope of the following appended claims.

I claim:

1. A floating digital display apparatus for use in a spa or hot tub, comprising:

a. a watertight buoyant housing having digital display means on an upper surface thereof;

b. a temperature probe mounted in the exterior of said housing for sensing the temperature of water in said spa or hot tub;

c. temperature conversion means whereby temperature of the water is measured by the temperature probe and converted to a digital signal displayed on the digital display in the form of numeral segments;

d. timing circuitry for maintaining time and date contained within said housing, and automatic shut-off circuitry such that the digital display means is activated for only a predetermined period of time before being automatically shut off;

e. alarm circuitry and alarm means to indicate expiration of a preset time period;

f. a plurality of membrane switches on the exterior of said housing enabling manual activation of each of the temperature conversion means, timing circuitry and alarm circuitry;

g. a movement sensitive switch electrically interconnecting a battery and the temperature probe, such that upon sufficient movement of the housing the movement sensitive switch activates the temperature probe and the digital display means; and

h. the battery and the movement sensitive switch are arranged such that the center of the mass of the battery and the movement sensitive switch is adjacent the bottom of the buoyant housing and the digital display means is adjacent the top of the

buoyant housing to ensure the digital display means remains up when in a floating position.

2. The apparatus as recited in claim **1**, wherein the movement sensitive switch is a weighted microswitch.

3. A hand held device operable when introduced into a liquid container to measure the temperature of the liquid in the container from an easy line of sight visual inspection by a person in relatively close proximity to said device, said device including, in combination:

a buoyant housing having top and bottom surfaces thereof adapted to receive active components for said device,

b. one or more batteries mounted on or adjacent to said bottom surface of said housing and, by gravitational forces, maintaining said housing in an upright position when floating so that said top surface is visible from a line of sight by a person in a nearby location when said device is introduced

c. temperature read out display means provided on or adjacent to said top surface of said housing,

d. temperature sensing means connected to temperature measuring means within said housing to provide an indication of the temperature of said liquid, said temperature measuring means being further connected to said temperature read out display means, and

e. temperature read out activation means connected between said one or more batteries and said temperature measuring means and responsive to an electrical activation signal applied thereto for interconnecting said one or more batteries to said temperature measuring means when it is desired to visually obtain the existing temperature of said liquid in said liquid container, said activation means includes motion responsive means operative in response to the instantaneous motion applied to said device for electrically activating said temperature read out activating means and thereby connecting one or more of said batteries to said temperature measuring means within said housing to thereby initiate a temperature read out indication on said temperature read out display means of the current temperature within said liquid container.

4. The device defined in claim **3** which further includes timing means connected to said temperature read out display means and being activated to start a time out period when said temperature read out display means is activated, whereby said timing means is operable to display the temperature within said liquid container for a predetermined period of time.

5. The device defined in claim **4** which further includes PH sensing means connected to PH measuring means within said housing to provide an indication of the PH level of said liquid.

6. The device defined in claim **4** which further includes oxidation reduction potential sensing means connected to oxidation reduction potential measuring means within said housing to provide an indication of the oxidation reduction potential of said liquid within said liquid container.

7. The device defined in claim **6** which further includes PH sensing means connected to PH measuring means within said housing wherein said temperature measuring means, said PH measuring means, and said oxidation reduction potential measuring means are constructed of a microprocessor said operative for parallel processing of output signals from said temperature sensing means, PH sensing means, and oxidation reduction potential sensing means to provide a high degree of measurement versatility for said device.

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