United States Patent [19]

Foellner

[11] **3,855,784**

[45] **Dec. 24, 1974**

[54] **ILLUMINATED TIME PIECE**

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[21] Appl. No.: **383,989**

[52] **U.S. Cl.** ..... **58/50 R,** 240/6.43

[51] **Int. Cl.** **G04b 19/30**

[58] **Field of Search** ..... 58/33, 50 R, 85.3; 240/6.43

[56] **References Cited**

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3,505,804	4/1970	Hofstein	58/23
3,576,099	4/1971	Walton	58/23 R
3,729,923	5/1973	Brigliano et al	58/50 R
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Primary Examiner—Edith Simmons Jackmon

Attorney, Agent, or Firm—Woodcock, Washburn, Kurtz & Mackiewicz

[57] **ABSTRACT**

A wrist watch has a bulb which periodically illuminates the watch face. A solid state oscillator circuit periodically energizes the bulb at a rate which imposes an acceptable current drain on the battery. Two mercury switches are connected in series between the battery and oscillator circuit. They are oriented in the watch so that they energize the bulb only when the watch is held in a viewing position in front of the wearer.

4 Claims, 7 Drawing Figures

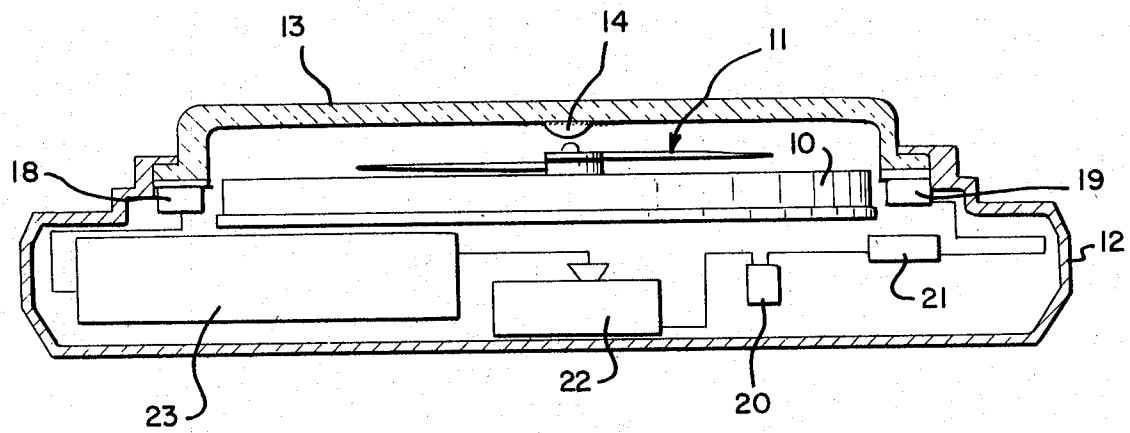
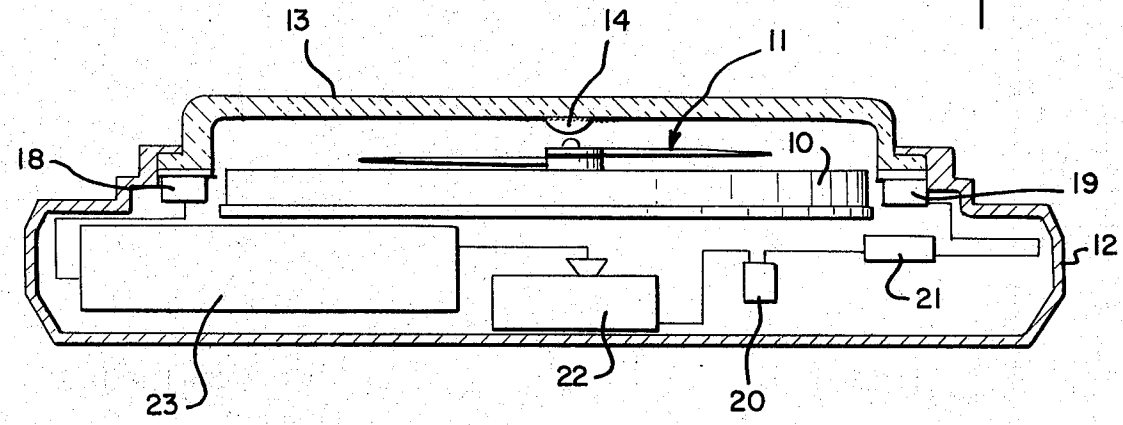


Fig. 1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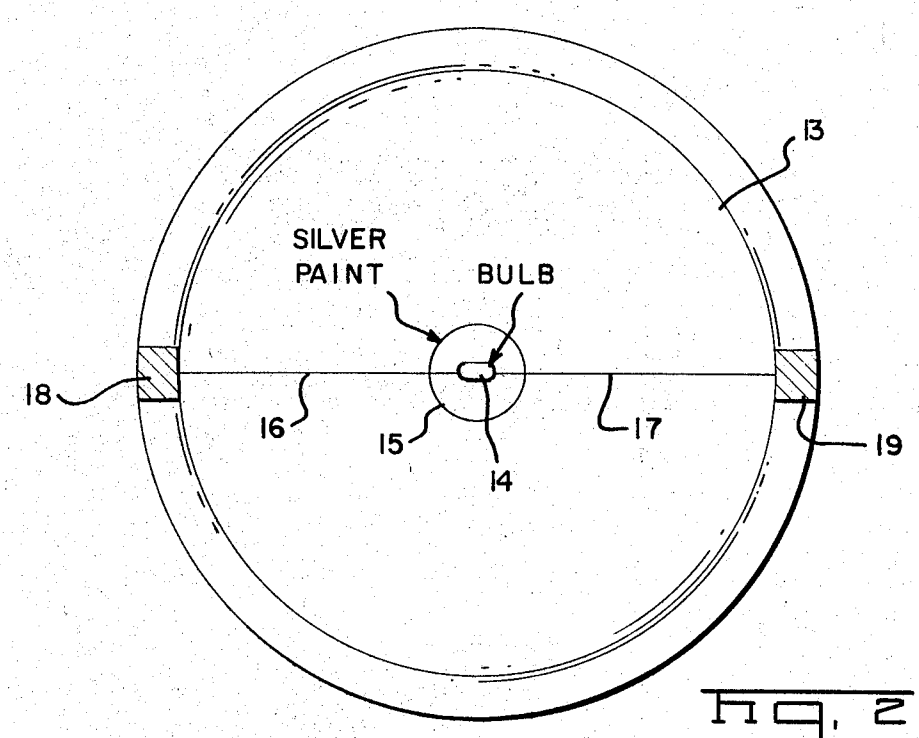
13
SILVER
PAINT
BULB
18
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14
17
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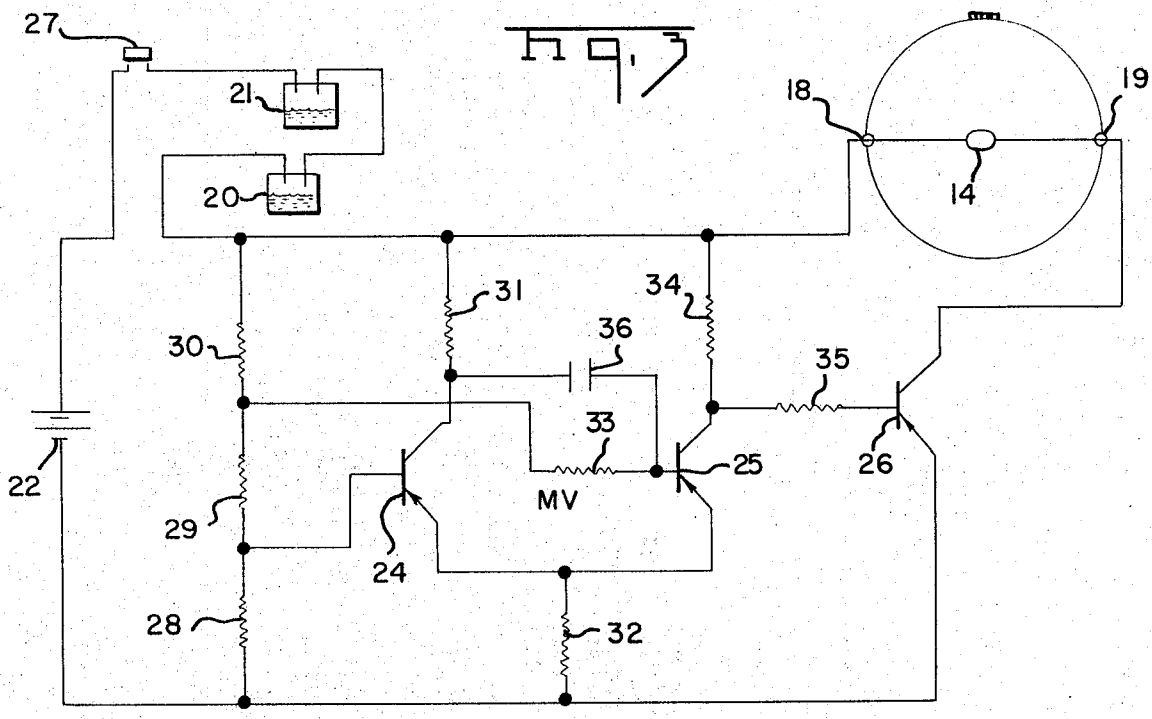
Fig. 2

Fig. 3



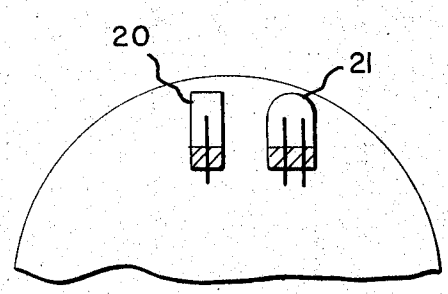


Fig. 4A

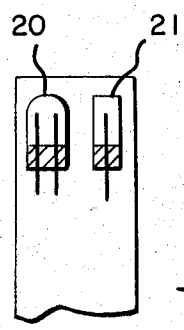


Fig. 4B

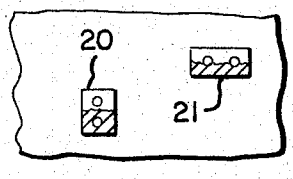


Fig. 4C

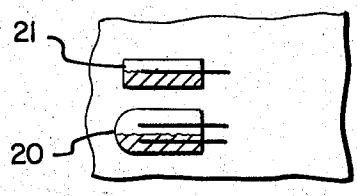


Fig. 4D

ILLUMINATED TIME PIECE

BACKGROUND OF THE INVENTION

This invention relates to time pieces and more particularly to a time piece which is periodically illuminated by a battery energized bulb.

Illumination of time pieces to permit viewing in darkness has long been desired. The most successful attempts to provide wrist watches which are readable in the dark include dial faces painted with some type of luminescent paint. However, even the most successful of these are not readable in total darkness.

Bulb illuminated watches are in the prior art. Conventional push button or pressure actuated switches turn on the bulb in the watches shown in U.S. Pat. Nos. 3,114,236, 3,116,883, 3,284,977, 3,508,044, 3,651,587 and 3,729,923. It is inconvenient to manually actuate a switch when it is desired to read the watch.

Another problem in illuminating a watch dial face with a bulb is providing a current source of sufficient capacity. A battery having enough capacity to energize a bulb conventionally will normally be too large to be included in a wrist watch. Batteries which are small in size have been developed but these batteries do not have sufficient current capacity to energize a bulb conventionally.

SUMMARY OF THE INVENTION

In accordance with this invention a watch dial face is illuminated by a bulb to permit viewing in total darkness. In accordance with one aspect of the invention the bulb is energized periodically from a battery under control of a solid state oscillator at a rate which imposes an acceptable current drain on the battery.

In accordance with another aspect of this invention position responsive switches, mercury switches in the perferred embodiment, are oriented in the watch so that they are closed to energize the bulb only when the watch is held in a viewing position.

The foregoing and other objects, features and advantages of the invention will be better understood from the following more detailed description and appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional side view of the watch;

FIG. 2 is a top view of the crystal;

FIG. 3 is a circuit diagram of the bulb energizing circuit;

FIG. 4A depicts the position of the mercury switches in the watch when the watch is held in a position with dial directly in front of the face in reading position;

FIG. 4B is a side view of FIG. 4A;

FIG. 4C depicts the mercury switches when the watch is placed in a flat position; and

FIG. 4D is a side view of FIG. 4C.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. 1 the watch includes the usual movement **10** which moves hands **11** over a dial face. A case **12** has a crystal **13.** A bulb **14** is mounted in the middle of the crystal to illuminate the dial face. Silver paint **15** hides the bulb from view. Thin conductive leads **16** and **17** are formed from electrically conductive paint. They connect the bulb to the electrical contacts **18** and **19** at the edges of the crystal. Mercury switches **20** and **21** connect the bulb to a battery **22** which in the example under consideration is a small mercury cell. Electronic circuitry **23** is preferably an integrated circuit oscillator but may also be implemented with transistors.

FIG. **3** shows a suitable circuit for intermittently energizing the bulb. The circuit includes a free running multivibrator oscillator including transistors **24** and **25.** This oscillator drives the output transistor **26** which supplies current from the battery **22** to the bulb **14.** In a particular embodiment of the invention the oscillator energized the bulb every 1.2 seconds. This is sufficiently fast that there is not a bothersome flicker in the illumination. This type of illumination is particularly useful when a watch dial with luminescent numerals is used. The luminescent material completely integrates out any flicker in the illumination. At the same time this intermittent energization of the bulb is quite conservative of current drain on the battery.

Batteries such as mercury cells of the type suitable for use cannot supply a steady current drain. However, an intermittent current can be sustained for quite long periods of time.

The switches **20** and **21** connect the bulb to the intermittent energizing current only when the watch is held in a particular position, desirably when the watch is held with its face directly in front of the viewer's eyes. A manually operated slide switch **27** is provided to disconnect the circuit when the watch is not in night time use to prevent inadvertent draining of the battery.

Several types of position responsive switches are suitable for use but we have found mercury switches particularly suitable. These are gravity actuated switches. They include a capsule with two contacts therein and a small volume of mercury. When the capsule is positioned so that the mercury is drawn to the contact containing end of the capsule, the switch is closed. Other position responsive switches are suitable for use. Reed switches are available which are actuated by a magnet. These are available as gravity actuated switches wherein the magnet falls to close the contacts when the switch is in a particular position. Alternatively these switches are closable when the switch is brought into proximity with a metallic actuator. It will be appreciated that various types of position responsive switches can be used to enable the actuation of the switch only when it is placed in a desired position.

The following typical circuit components are given by way of example only and are not meant to be limiting of the invention.

Switch	20
	21
Battery	22
	24
Transistor	24 — GE-2
	25 — GE-2
	26 — GE-2
Bulb	14 — No. 40,689 (1.5v — 15MA)
Resistor	28 — 390 ohms
	29 — 91 ohms
	30 — 510 ohms
	31 — 1100 ohms
	32 — 470 ohms
	33 — 6800 ohms
	34 — 580 ohms
	35 — 2600 ohms
Capacitor	36 — 100 MFE at 3V

FIGS. 4A-4D depict the orientation of the mercury switches with respect to the watch. In FIGS. 4A and 4B the watch is in a vertical position. When a wrist watch is brought directly in front of the wearer's face, it will be in a vertically oriented reading position. In this position both mercury switches **20** and **21** are closed. This is the only position in which both switches are closed. FIGS. 4C and 4D depict the condition of the switches when the watch is lying flat on a horizontal surface. In this case the switch **21** is closed but hte switch **20** is open so that the watch is not illuminated. There are other positions in which one or the other of the switches will be closed but the only position in which both switches are closed in the vertically oriented reading position depicted in FIGS. 4A and 4B.

While a particular embodiment of the invention has been shown and described various modifications are within the true spirit and scope of the invention and are intended to be covered by the appended claims.

What is claimed is:

1. In a time piece including a movement, a face, a case and a crystal therefor, a bulb for illuminating said face, a battery for energizing said bulb, and an improved position responsive switch means comprising:

first and second gravity actuated switches connected in series, and

said first and second gravity actuated switches being positioned orthogonal to one another so that both switches are closed only when said time piece is substantially vertically oriented in a reading position, said position responsive switch means being located within said watch casing and connected between said battery said bulb to selectively energize said bulb when said time piece is substantially vertically oriented in said reading position.

2. The time piece recited in claim **1** wherein said first and second gravity actuated switches include a capsule containing mercury which bridges two switch contacts when said capsule is oriented so that the mercury is in the contact containing end of the capsule.

3. The watch recited in claim **1** wherein said bulb is mounted under and in the center of said crystal, thin conductive leads being deposited on said crystal from said bulb to edge of said crystal at which point they can be connected to the electrical circuitry including said battery and said switch means.

4. In a time piece including a movement, a face, a case and a crystal therefor, a bulb for illuminating said face, a battery for energizing said bulb, and the improvement comprising:

a solid state oscillator means located between said battery and said bulb to periodically energize said bulb at a current conserving rate when said solid state oscillator is energized by said battery,

a switch means connected between said battery and said bulb to selectively energize said solid state oscillator, and

a plurality of luminescent numerals located on said face of said time piece to integrate intermittent energization of said bulb when said solid state oscillator is energized by said battery.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,855,784 Dated December 24, 1974

Inventor(s) Donald M. Foellner

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 2, "battery said bulb" should read
--battery and said bulb--.

Column 4, line 13, "bulb to edge" should read
--bulb to the edge--.

Signed and sealed this 18th day of February 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

PO-1050
(5/69)

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