

United States]

3,733,804

Diersbock

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- [54] ELECTRONIC ALARM WATCH
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- [73] Assignee: Timex Corporation, Waterbury,
Conn.
- [22] Filed: Sept. 29, 1971
- [21] Appl. No.: 184,735
- [52] U.S. Cl.58/38, 58/57.5, 340/309.1,
340/321, 340/384 E
- [51] Int. Cl.G04c 21/00
- [58] Field of Search58/23 R, 38, 39,
58/57.5; 340/309.1, 321, 384 E

[56] References Cited

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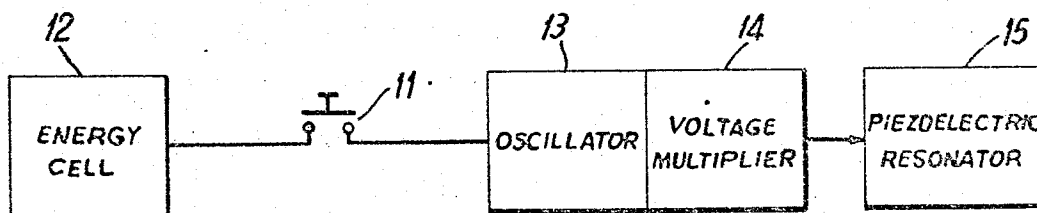
3,341,841	9/1967	Stampfli	58/38 X
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Primary Examiner—George H. Miller, Jr.
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[57] ABSTRACT

An electronic alarm wrist watch comprises a piezoelectric oscillator which vibrates the watch dial, crystal, or parts of the bezel such as the crystal mounting ring to produce an audible sound at predetermined times. The piezoelectric oscillator is energized by a low or high voltage power oscillator.

11 Claims, 11 Drawing Figures



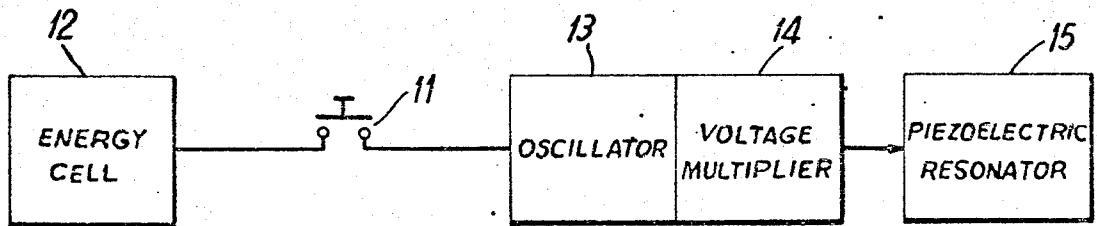


FIG. 1

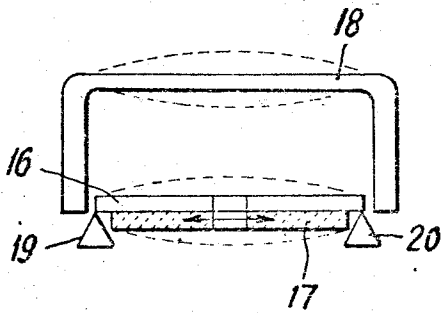


FIG. 2

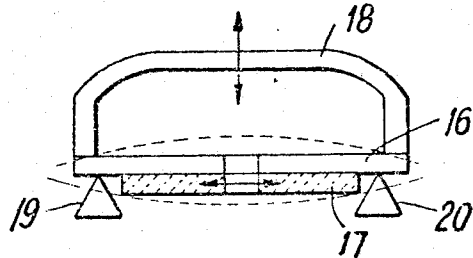


FIG. 3

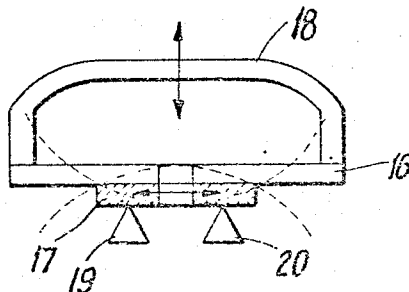


FIG. 4

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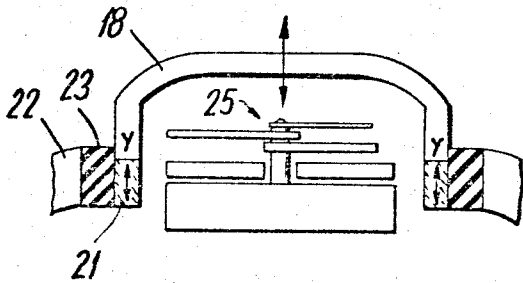


FIG. 5

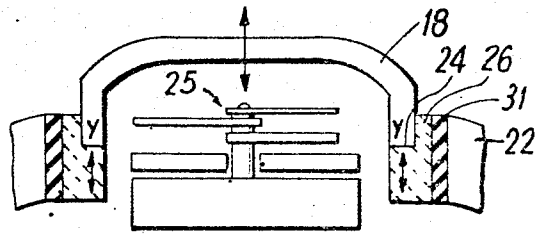


FIG. 6

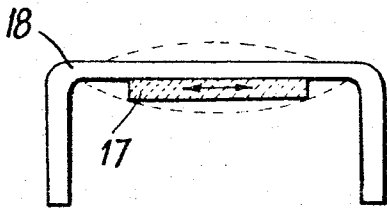


FIG. 7

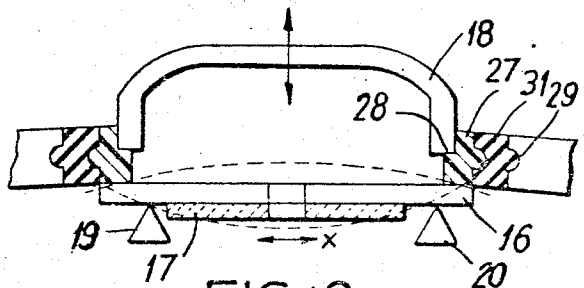


FIG. 8

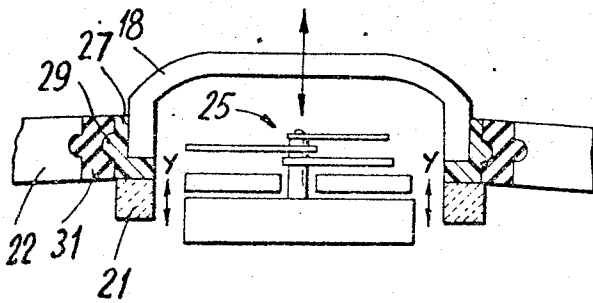


FIG. 9

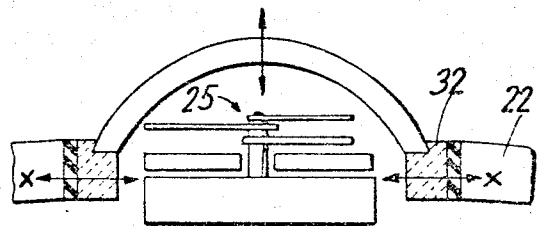


FIG. 10

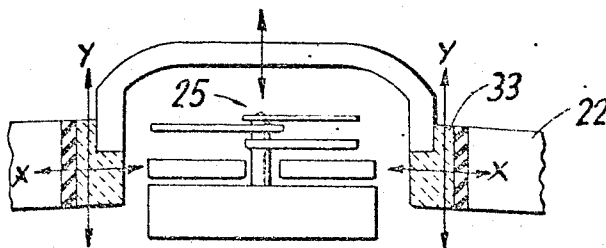


FIG. 11

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ELECTRONIC ALARM WATCH

BACKGROUND OF THE INVENTION

The present invention relates to the field of horology and particularly to an electronic alarm watch having a unique alarm means.

In conventional electric or electronic alarm watches, such as shown in U.S. Pat. No. 3,462,943, a spring blade or tuning fork is vibrated at its natural frequency and cooperates with other portions of the watch to produce an audible alarm. Alarm watches per se, are known devices but existing alarm arrangements often are not water-proof or dust-proof. Furthermore, most alarm watches are not very efficient, that is, the alarm is often not loud enough. U.S. Pat. Nos. 3,114,848; 3,377,465, and 3,341,841 are typical of the prior art in this area of invention and not intended to be an inclusive listing since other patents may exist and be pertinent.

SUMMARY OF THE INVENTION

The present invention relates to an alarm device for an electric or electronic watch comprising a piezoelectric oscillator which vibrates a predetermined portion of the watch to produce an alarm signal. An energy cell is connected to a voltage multiplying or transforming oscillator by a mechanical or electronic alarm switch which may be set to any particular time. The output of the oscillator energizes the piezoelectric resonator with an AC or DC pulse to produce an audible alarm. The resonator may comprise the watch dial, crystal or parts of the bezel such as the crystal mounting ring. According to the invention the watch dial would be coated with a piezoelectric ceramic material, the piezoelectric ceramic would be mounted in the center of the watch crystal or the crystal would be mounted on a piezoelectric ceramic ring.

Accordingly, it is an object of the this invention to provide a new and improved alarm watch.

Another object of this invention is to provide a highly efficient alarm device for a wrist watch which is water-proof and dustproof.

A further object of this invention is to provide a new and improved alarm watch wherein the alarm sound is produced by a piezoelectric resonator comprising a part of the watch such as the dial or crystal mounting ring.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will be more clearly seen when viewed in conjunction with the accompanying drawings wherein:

FIG. 1 is a schematic block diagram showing the alarm portion of the watch incorporating the present invention; and,

FIGS. 2 to 11 illustrate various embodiments of the piezoelectric resonator portion of the apparatus.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, the invention comprises an alarm watch including a mechanical or electronic switch 11 which is settable to the precise time desired for alarm sounding. A conventional watch energy cell 12 supplies 1.5 volts to the oscillator 13 when the switch 11 closes activating the alarm. The oscillator 13 and voltage multiplier 14 are similar to the arrangements disclosed in applicant's pending application, Ser.

No. 87,215 filed Nov. 11, 1970. The 1.5 volt input is raised to a level sufficient to operate the piezoelectric resonator 15 by the oscillator 13 and voltage multiplier 14. Variations of the power supply arrangement such as using a transformer in place of the voltage multiplier 14 may be employed to operate the resonator 15 with AC or DC pulses.

The piezoelectric resonator 15 comprises any one of the various embodiments shown in FIGS. 2-11. In FIG. 2, for example, the resonator comprises a dial 16 which is coated with piezoelectric ceramic material 17. Upon receiving pulses from the voltage multiplier 14, the material 17 expands and contracts causing the movement of the dial 16 and crystal 18 shown in phantom. The vibration of the dial 16 and crystal 18 produces the alarm sound. To maximize the vibration of the dial 16, it is mounted close to the edge as shown schematically with supports 19 and 20.

The numerical designations are retained as far as possible for FIGS. 3-11 of the drawings for purposes of consistency. In FIG. 3, for example, the arrangement is similar to FIG. 2 except that the watch crystal 18 rests upon the dial 16. The dial 16 extends beyond the supports 19 and 20 while the crystal is of slightly different configuration.

FIG. 4 is similar to FIGS. 2 and 3 with the prime exception that the mounting is close to the center of the dial 16 with supports 19 and 20 being spaced in close proximity and engaging the ceramic material 17. The piezoelectric coating 17 also covers less of the dial surface.

In FIG. 5, the watch crystal 18 rests upon a piezoelectric ceramic ring 21 and is vibrated up and down about the movement 25 as shown. The crystal 18 is connected to the watch case 22 by an elastic ring 23 of rubber or a similar material. FIG. 6 is similar to FIG. 5 with the difference that the watch crystal 18 is mounted to a piezoelectric ring 21 which is sealed to the case 22 with an elastic sealing compound 31. The ring 21 also includes a shoulder portion 24 and upwardly extending outer portion 26 which engage the crystal 18.

In a further embodiment, FIG. 7, the ceramic material 17 may be mounted to the center of the watch crystal 18. The material 17 or the distribution thereof on the crystal would have to be such as not to obstruct the dial 16.

FIG. 8 shows an alarm arrangement wherein the crystal 18 is fitted into a metal or plastic ring 27 which rests on the vibrating dial 16. The ring 27 may have a cut-away upper portion 28 to accommodate the crystal 18 and a protrusion 29 to anchor the ring to the elastic sealing material 31.

FIG. 9 depicts an embodiment wherein the crystal ring 27 rests upon a vibratory ceramic ring 21. It is similar in other respects to FIG. 8.

In FIGS. 10 and 11, the mode of the piezoelectric ceramics 32 and 33, respectively, differ from the previous embodiments which vibrated in a vertical direction. FIG. 10 is similar to FIG. 5 with the exception that an X mode ceramic is used rather than a Y mode. On the other hand FIG. 11 is similar to FIGS. 5 and 9 except that an X-Y mode piezoelectric ceramic is used.

From the above embodiments, it is to be noted that complex mechanical alarm systems are avoided and a reliable and inexpensive electronic alarm is used. It is to be understood that the above described arrangements are merely illustrative examples of the applica-

tion. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

I claim:

1. In an alarm wrist watch, the combination comprising:

- an energy cell,
- switch means connected to the energy cell and settable to any particular time for alarm purposes, said switch being also connected to the watch for activation thereby when the particular time occurs,
- a voltage multiplying means and oscillator connected in series to the switch means and activated when the switch is closed, said voltage multiplying means providing pre-determined output pulses, and,
- alarm means activated by the output pulses, said alarm means comprising a piezoelectric resonator which directly vibrates a portion of the watch to produce an audible sound.

2. An alarm watch in accordance with claim 1 wherein:

- the alarm means comprises a piezoelectric ceramic ring having the crystal mounted thereon and an outer elastic ring joining the piezoelectric ceramic ring and crystal together.

3. An alarm watch in accordance with claim 1 wherein:

- the alarm means comprises a piezoelectric ceramic ring having the crystal mounted thereon and an elastic sealing material bonding the ceramic ring to the case.

4. An alarm watch in accordance with claim 1 wherein:

- the alarm means comprises a piezoelectric ceramic material in disc form mounted to the center of the crystal.

5. An alarm watch according to claim 1 wherein: the alarm means comprises a piezoelectric material connected to a portion of the watch to vibrate said portion to produce an audible sound.

6. An alarm watch in accordance with claim 5 wherein:

- the alarm means comprises a dial coated with piezoelectric ceramic material, the dial being mounted within the watch close to the periphery of the said dial and including a crystal which is not mounted to the dial but vibrates therewith.

7. An alarm watch in accordance with claim 5 wherein:

- the alarm means comprises a dial coated with piezoelectric ceramic material, said dial having the crystal resting thereon and being supported in from the periphery thereof.

8. An alarm watch in accordance with claim 1 wherein:

- the watch includes a crystal and a watch case and the alarm means comprises a notched ring having the periphery of the crystal mounted in said notch, an elastic ring joining the ring to the watch case, and a dial having a coating of piezoelectric ceramic material mounted thereto.

9. An alarm watch in accordance with claim 8 wherein:

- the piezoelectric ceramic material comprises a ring having the notched ring mounted thereon.

10. An alarm watch in accordance with claim 8 wherein:

- the piezoelectric material is an X-mode ceramic.

11. An alarm watch in accordance with claim 8 wherein:

- the piezoelectric material comprises an X-Y mode ceramic.

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