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(54) ELECTRIC WATCH CONTACT ASSEMBLY

(71) We, TIMEX CORPORATION, a Corporation organized under the Laws of the State of Connecticut, United States of America, of Waterbury 20, Connecticut, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to horology and more particularly to a contact assembly for an electric watch.

Electric watches have been accepted by the public. They do not need to be wound and they can be accurate, as their batteries provide a relatively constant power compared to spring driven watches. However, electric watches have been relatively expensive.

The power for an electric watch comes from a battery cell within the case. The cell must be small so that its power is limited. Generally, it is desired that the battery cell is replaced no more often than once a year. Consequently, the power consumption of the motor of the watch must be low. One method of attempting to provide such low power consumption has been to manufacture the parts with high accuracy and to assemble them using highly skilled labour. The many parts of an electric watch, and their careful assembly, has proven costly. For example, at the present time, the least expensive electric watch sells for three or four times the price of a spring-driven watch.

It is the objective of the present invention to provide a contact assembly for an electric watch, which contact assembly is relatively low in cost and replaces a number of parts.

It is a further objective of the present invention to provide a contact assembly for an electric watch which does not need skilled labour to produce and assemble into place and which replaces a number of parts requiring assembly.

[Price 5s. 0d. (25p)]

In accordance with the present invention there is provided an electric watch powered by an electric battery cell, including a frame plate, a balance wheel carrying a contact pin, and a contact assembly fixed to the frame plate, said contact assembly comprising a body member of insulative material, said body member being fixed to the frame plate, a terminal spring of spring metal having a first end adapted to contact a terminal of the battery, the centre portion of the terminal spring being embedded in the body member, and a contact spring fastened to the second end of the terminal spring, said contact spring having a free end adapted to intermittently touch the contact pin.

A preferred electric watch embodying the invention has a pivotable oscillatory balance wheel which acts as its time base. The balance wheel carries an electric coil wound with fine wire and a contact pin. A small electric battery cell is positioned within the watch case. A hairspring, connected at one of its ends to a hairspring hub on the balance wheel staff, serves as one connection from the battery to the coil. The other connection, from the battery to the coil, is the intermittent contact formed by the touching of a contact spring with the contact pin on the balance wheel. The contact spring is part of the contact assembly. The contact assembly includes the insulative body member and the battery terminal contact spring. The insulative body has dowels (lugs) which act as a locator in the assembly of the watch. The insulative body also acts as a spacer, i.e., it separates parts of the watch. Preferably, the body is moulded in plastics with the battery terminal spring moulded in place.

The contact assembly is relatively low in cost as the positioning of the battery terminal spring, relative to the body member, is part of the moulding operation. The assembly of the contact assembly in the watch may be performed by relatively unskilled labour. The contact assembly may

replace the assembly of the following parts:

- (1) a separate terminal spring to contact the battery and a screw to hold it to an insulative base;
- (2) the insulative base and the screw to hold the base piece to the frame;
- (3) a wire or other conductive member from the battery terminal spring to the contact spring;
- (4) a mounting for the contact spring;
- (5) a screw or other device to mount the contact spring on its mounting;
- (6) a damping ring or damping spring to control the oscillation of the contact spring; and
- (7) a pillar or other spacing device to separate the plates.

Other objectives of the present invention will be apparent from the detailed description of the preferred embodiment described below, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a top plan view of a portion of the movement of an electric watch;

Figure 2 is a top plan view of the contact assembly of the present invention; and

Figure 3 is a side plan view of the contact assembly.

As shown in Figure 1, the electric watch includes a balance wheel 10 as its time base. The balance wheel is pivoted to oscillate in bearings between a frame plate 11 and a balance bridge (not shown). The balance wheel 10 is carried on a balance wheel staff 12. The balance wheel 10 carries an electrical coil 13 wound of many turns of fine wire. The coil 13 is adhered by glue 14 to an arm 15 of the balance wheel. The balance wheel 10 also carries, either directly on the arm 15 or on a roller 30, a "D" shaped insulative jewel 16 and a metal contact pin 17. A wire connects contact pin 17 to one end of the coil 13. The other end of coil 13 is connected to the inner end of a hairspring (not shown). The inner end of the hairspring is connected to a hairspring hub on the balance wheel staff. The outer end of the hairspring is connected to a frame member, which acts as an electrical ground.

A small electrical battery cell 18 is positioned within the case. The contacts of the battery are on its base (the bottom) and on its top. The bottom battery contact touches and contacts the frame of the movement. The top contact of cell 18 is in contact with a terminal spring 19.

The terminal spring 19 is part of a contact assembly 20. The terminal spring 19 has a battery contact portion 21 which pushes downwardly on the top of the cell 18, a centre portion 22, and an end portion 23. The centre portion 22 is embedded within the body member 24 of the assembly.

The body member 24 is an insulative member which preferably is moulded from a plastics resin. A suitable plastics resin is nylon as it is a good insulator, it is dimensionally stable and it may be accurately

moulded. Preferably the terminal spring 19 is placed in the mould and the plastics resin flowed into the mould under pressure to mould the body member 24 with the terminal spring 19 in place.

The body member 24 is formed with first and second integral locating dowels (lugs) 25 and 26, respectively. The bottom face 27 (aside from the dowels) and the top face 28 of body member 24 are flat so that the body member 24 may act as a spacer. As shown in Figure 3, the body member 24 is positioned between the frame 11 and the train bridge 37 and acts, in place of a pillar, to space them apart. The locating dowels 25 and 26 fit in holes in the train bridge 37 or the frame 11 and serve to locate the contact assembly in the assembly of the watch and to retain the train bridge in position subsequent to assembly. A screw 31, which fits through a hole in the train bridge, and an indentation 32 in the body member (see Figure 1) is screwed into threads in a hole 33 in the frame 11. The screw 31 keeps the train bridge, body member and frame together.

The end portion 23 of the contact assembly has an inverted L-shaped portion 34. The contact spring 35 is connected to the portion 34 by soldering, a conductive glue, welding or other methods. The contact spring 35 is simply a straight flat elongated spring metal piece without a damping ring or damping means, in contrast to the elaborate contact springs of other electric watch movements. The end 36 of contact spring 35 is positioned to contact pin 17 twice during each full oscillation of the balance wheel 10. The contact spring 35 may be adjusted inward or outward, in relationship to the balance wheel centre, or vertically (parallel to the balance wheel axis) or radially (about the centre of its fastened end) by bending or twisting the narrow end portion 23.

WHAT WE CLAIM IS:—

1. An electric watch powered by an electric battery cell, including a frame plate, a balance wheel carrying a contact pin, and a contact assembly fixed to the frame plate, said contact assembly comprising a body member of insulative material, said body member being fixed to the frame plate, a terminal spring of spring metal having a first end adapted to contact a terminal of the battery, the centre portion of the terminal spring being embedded in the body member, and a contact spring fastened to the second end of the terminal spring, said contact spring having a free end adapted to intermittently touch the contact pin.

2. An electric watch as claimed in claim 1, wherein the body member has at least one protruding locating dowel.

3. An electric watch as claimed in claim 1

replace the assembly of the following parts:

- (1) a separate terminal spring to contact the battery and a screw to hold it to an insulative base;
 - (2) the insulative base and the screw to hold the base piece to the frame;
 - (3) a wire or other conductive member from the battery terminal spring to the contact spring;
 - (4) a mounting for the contact spring;
 - (5) a screw or other device to mount the contact spring on its mounting;
 - (6) a damping ring or damping spring to control the oscillation of the contact spring; and
 - (7) a pillar or other spacing device to separate the plates.
- Other objectives of the present invention will be apparent from the detailed description of the preferred embodiment described below, taken in conjunction with the accompanying drawings, in which:

- Figure 1 is a top plan view of a portion of the movement of an electric watch;

Figure 2 is a top plan view of the contact assembly of the present invention; and

- Figure 3 is a side plan view of the contact assembly.

As shown in Figure 1, the electric watch includes a balance wheel 10 as its time base. The balance wheel is pivoted to oscillate in bearings between a frame plate 11 and a balance bridge (not shown). The balance wheel 10 is carried on a balance wheel staff 12. The balance wheel 10 carries an electrical coil 13 wound of many turns of fine wire. The coil 13 is adhered by glue 14 to an arm 15 of the balance wheel. The balance wheel 10 also carries, either directly on the arm 15 or on a roller 30, a "D" shaped insulative jewel 16 and a metal contact pin 17. A wire connects contact pin 17 to one end of the coil 13. The other end of coil 13 is connected to the inner end of a hairspring (not shown). The inner end of the hairspring is connected to a hairspring hub on the balance wheel staff. The outer end of the hairspring is connected to a frame member, which acts as an electrical ground.

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The body member 24 is an insulative member which preferably is moulded from a plastics resin. A suitable plastics resin is nylon as it is a good insulator, it is dimensionally stable and it may be accurately

moulded. Preferably the terminal spring 19 is placed in the mould and the plastics resin flowed into the mould under pressure to mould the body member 24 with the terminal spring 19 in place.

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WHAT WE CLAIM IS:—

1. An electric watch powered by an electric battery cell, including a frame plate, a balance wheel carrying a contact pin, and a contact assembly fixed to the frame plate, said contact assembly comprising a body member of insulative material, said body member being fixed to the frame plate, a terminal spring of spring metal having a first end adapted to contact a terminal of the battery, the centre portion of the terminal spring being embedded in the body member, and a contact spring fastened to the second end of the terminal spring, said contact spring having a free end adapted to intermittently touch the contact pin.

2. An electric watch as claimed in claim 1, wherein the body member has at least one protruding locating dowel.

3. An electric watch as claimed in claim 1



or claim 2, wherein the watch includes a train bridge and the said body member is positioned between the frame plate and the train bridge and spaces them apart.

5 4. An electric watch as claimed in claim 3 as appended to claim 2, wherein the locating dowel fits within a hole in the train bridge or frame plate.

10 5. An electric watch as claimed in any one of claims 1, 2, 3 and 4, wherein the contact spring is an elongated flat spring metal member without a damping ring or other damping means.

15 6. An electric watch as claimed in claim 5, wherein the contact spring is fastened to the second end of the terminal spring by solder.

20 7. An electric watch as claimed in any one of the preceding claims, wherein the insulative body is of a moulded plastics resin and the terminal spring is moulded in place within the said body.

8. An electric watch as claimed in any one of the preceding claims, wherein the portion of the terminal spring adjacent the second end of the terminal spring is bendable so that the position of the contact spring may be adjusted. 25

9. An electric watch as claimed in claim 8, wherein the said adjacent portion is "L" shaped. 30

10. An electric watch substantially as hereinbefore described with reference to the accompanying drawings.

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