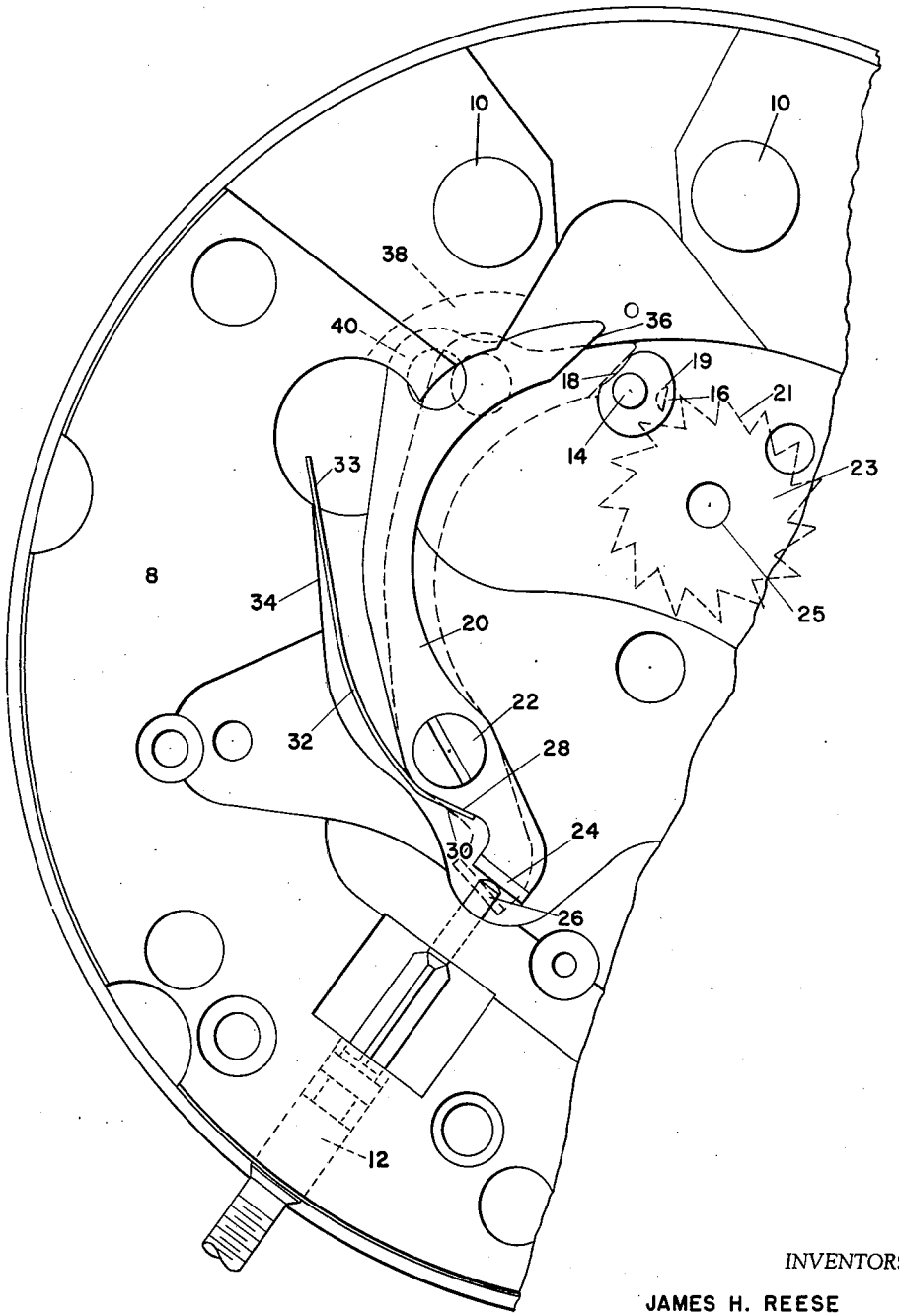
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BALANCE WHEEL ACTUATING MECHANISM

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BALANCE WHEEL ACTUATING MECHANISM

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This invention relates to electric watches and more particularly relates to a mechanism for utilizing the motion of the setting stem of the watch to perform secondary functions during the time that the setting stem is used to set the watch hands.

In a battery-powered electric watch of the general type shown in assignee's application of Biemiller and Reese, Serial No. 578,843, filed April 13, 1956, now Patent No. 2,972,745, dated February 21, 1961 the balance assembly carries a moving coil which cooperates with a series of stationary permament magnets to impulse the balance wheel and staff which in turn drive the train of the watch through a suitable indexing mechanism. In this type of arrangement, the stem which is usually used to wind the main spring of an ordinary watch has no function other than to be used for the setting of the hands. In prior watches the stem has thus been designed to move from a normal "in" position to an "out" setting position for setting the hands of the watch. In the aforementioned electric watch of assignee, in the "in" position a wheel carried by the clutch lever is disengaged from the minute wheel so that ordinarily there is no drag on the train because of the setting wheel.

This type of watch is designed to use an absolute minimum of electrical power so that a maximum life can be obtained with an extremely small source of electrochemical power. In the watch shown in the aforementioned copending application, the power is periodically connected to the moving coil by means of a commutating type arrangement, so that if the balance assembly comes to rest, no power is supplied to the coil and the watch will not start. That is to say, the watch is not self-starting and has to be given a shake or some agitation in order to cause the balance wheel to oscillate until the first contact is made and the coil energized by the primary cell.

Another feature of the operation of the same type watch is the fact that the power drive extends from the balance wheel, through the indexing gear, and then through the train of the watch to the hands. Upon resetting by the use of the previously described setting stem, the wheels of the train are caused to spin in a manner which, on some occasions, causes difficulties in the watch.

According to the present invention, a watch of the foregoing type is improved through the use of a mechanism actuated by the movable setting stem, so that when the stem is moved out in order to set the hands of the watch, the index mechanism is locked in position so that the wheels of the train will not spin. In addition to this, the same mechanism brings the balance assembly to rest in a pre-determined position such that the commutator or switching arrangement disconnects the battery from the coil to conserve the battery. This same predetermined position also insured that the hairspring which causes the balance wheel to oscillate is in a cocked position so that upon release of the setting stem, the energy stored in the hairspring returns the balance wheel to oscillation and starts the watch. This obviates the necessity for the shaking or other agitation previously necessary to start the watch and thereby eliminates undue strain upon the pivots of the balance wheel staff.

It is accordingly a primary object of the present invention to provide in a battery-operated electric watch a mechanism which cooperates with the setting stem to simultaneously prevent spinning of the train wheels upon setting

of the watch, stop motion of the balance wheel during setting of the watch, and cock the hairspring so that the watch is self-starting upon return of the setting stem to its original position.

It is another object of the invention to provide an electric watch having the foregoing type of mechanism which is provided in such a manner as to necessitate the addition of an absolute minimum number of parts to the already crowded watch case.

These and further objects and advantages of the invention will become more apparent upon reference to the following specification and claims and appended drawing.

The single FIGURE of the drawing is a top plan view of that portion of a pillar plate of a watch which is necessary to show the mechanism of this invention.

Referring particularly to the figure of the drawing, there is shown a pillar plate 8 for a battery-operated electric watch of the general type shown in the aforementioned Biemiller and Reese application Serial No. 578,843. As is discussed in further detail in that application, the pillar plate is formed with holes 10 for the reception of the permanent magnets which cooperate with the movable coil to drive the balance staff 14. Mounted in the pillar plate 8 in a conventional manner is a setting stem 12 adapted to be moved longitudinally to an outer hand setting position and returned to an inner inactive position.

The balance staff 14 carries a roller 16 having a concaved cam surface 18. This same roller also carries an indexing jewel 19 which is adapted to engage the teeth 21 of an indexing gear 23 mounted on a shaft 25. As is described in detail in assignee's copending application of Biemiller and Schoenrock, Serial No. 632,176, filed January 2, 1957 now Patent No. 2,977,750, dated April 4, 1961, the cam surface 18 on the roller 16 is so positioned that it is generally opposite to the jewel 19 for a purpose presently to become apparent.

A lever 20 is pivotally attached to the pillar plate by means of a shoulder screw 22 and has one end thereof formed with an upstanding tab 24 which is engaged by the end 26 of the setting stem 12. Attached to an edge 28 of the lever 20, as by means of a pair of welds, is one end 30 of a spring 32 having its other end 33 in engagement with a side 34 of a recess in the pillar plate. The spring 32 is under tension in this position and urges the lever 20 to rotate in a clock-wise direction. In the position of the lever and setting stem shown in the figure of the drawing this tendency to rotate is stopped by the abutment of the tab 24 against the end 26 of the setting stem 12 which is shown in its inward or inactive position.

The end of the lever 20 opposite the tab 24 is formed with a flattened portion 36 which is adapted to be brought into engagement with the concaved cam portion of the roller 16 when the setting stem 12 is pulled out in order to set the hands of the watch. As the setting stem is pulled out, the lever 20 pivots under the influence of the spring 34 bringing the flat surface 36 into engagement with the concaved cam surface 18 on the roller 16. A portion 38 of the pillar plate is milled out to provide a guide for the end of the lever 20 and a projection or rounded shoulder 40 on the lever travels within this milled section to insure that the lever remains in a plane which will engage the edge 18 of the roller 16. The engaging position of the lever is shown in broken lines in the drawing.

The flat surface 18 on the roller 16 is so positioned relative to the indexing jewel 19 that when the lever 20 engages the flat surface 18 the jewel 19 comes to rest in a position where it is engageable by the adjacent teeth 21 of the index gear 23. As the setting stem 12 is turned in order to set the hands of the watch, spinning of the train wheels is prevented by the teeth 21 of the indexing

gear 23 engaging the indexing jewel 19 which is locked in position by means of the lever 20.

While the balance wheel and hairspring are not shown, the roller 16 is so positioned on the staff 14 that when the lever 20 is pivoted to the broken line position so that the end 36 is brought into contact with the concaved portion 18 of the roller 16, the hairspring is held in a stressed or cocked position. Release of the lever 20 by moving the stem in permits the stressed hairspring to kick the balance wheel and thus start the operation of the watch. Further, the position of the roller 16 is so arranged with respect to the electrical contact carried by the balance staff 14 that in the position in which the balance staff is brought to rest the circuit between the primary cell which powers the watch and the coil on the balance wheel is broken to insure that there is no drain on the battery during the time that the hands of the watch are being set.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A mechanism for stopping both the balance wheel and index wheel of a watch during the setting operation comprising a spring driven balance staff carrying a balance wheel, a watch setting stem reciprocable into setting and non-setting positions, a pivotally mounted lever having one end spring urged toward said staff and the other end engaging said stem, said stem when in the non-setting position acting as a stop to prevent said one end of said lever from being moved toward said staff, indexing means comprising a roller and index jewel carried by said staff and fixed relative thereto, an index wheel, said index jewel driving said index wheel by periodic engagement of said index jewel with the teeth of said index wheel, said roller having a cam surface engageable by said one end of said lever when said stem is in the setting position to stop said balance wheel, said surface being shaped and placed to bring said balance wheel to rest with said index jewel between the teeth of said index wheel to prevent said index wheel from spinning freely.

2. A mechanism according to claim 1 wherein said balance wheel is stopped by said lever with said balance wheel in a cocked position.

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