Oct. 23, 1962 H. S. DETWILER 3,059,413

PALLET FORK CONTACTING AND INDEXING MEANS FOR ELECTRIC WATCH

Filed Jan. 2, 1959 2 Sheets-Sheet 1

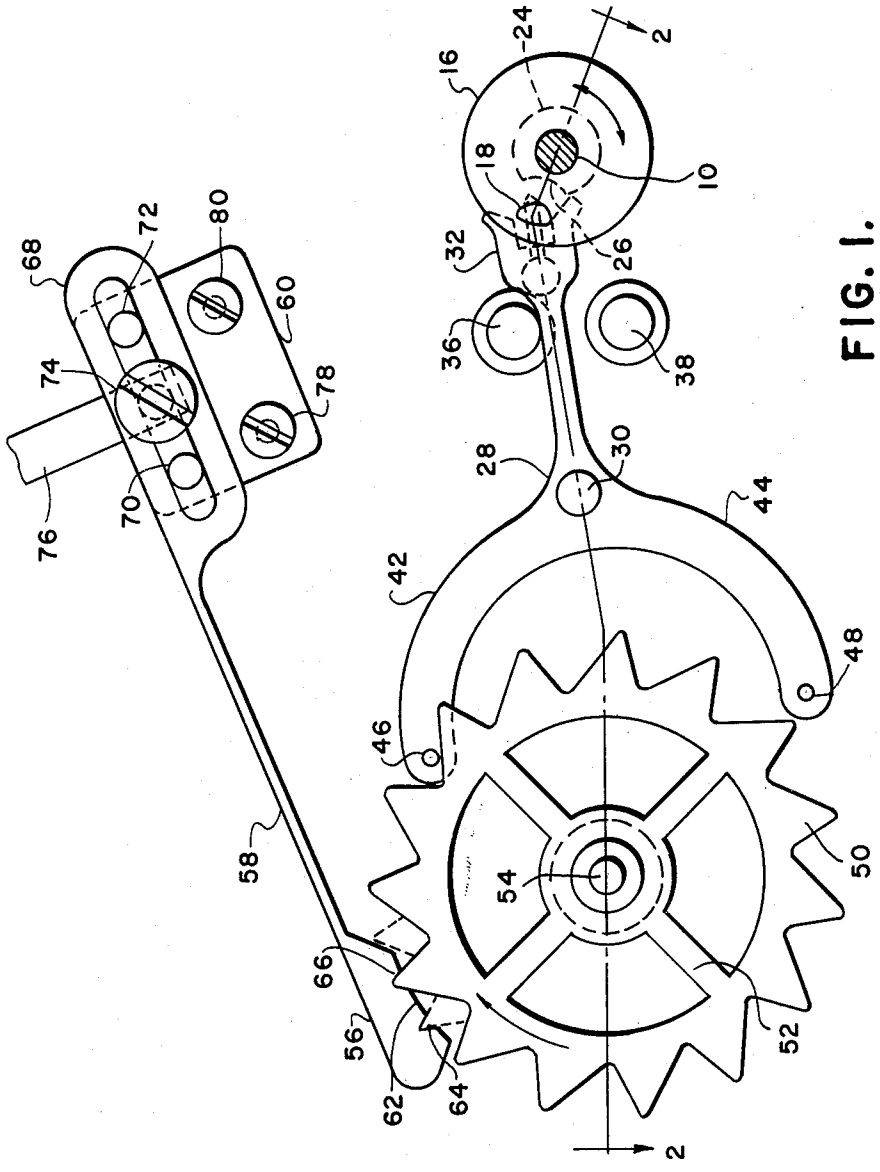

FIG. 1.

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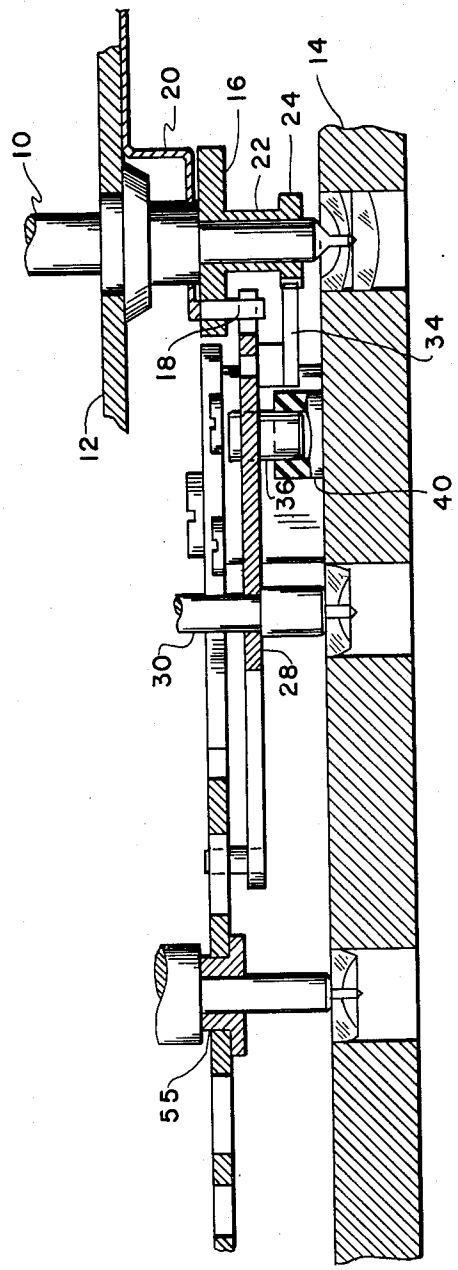

FIG. 2.

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PALLET FORK CONTACTING AND INDEXING MEANS FOR ELECTRIC WATCH

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11 Claims. (Cl. 58—28)

This invention relates to battery operated electric watches and more particularly relates to the contact, indexing and overbank preventing arrangement used in such watches.

In assignee's copending application Serial No. 409,934, filed February 12, 1954, and now Patent No. 2,888,797, there is disclosed a battery operated electric watch wherein the balance wheel carries a coil adapted to cooperate with permanent magnets mounted on the pillar plate of the watch to provide impulsing to the balance wheel in order to sustain it in oscillation.

This coil is energized periodically through a contact system which is carried by the balance wheel assembly and which provides connections to the watch contained battery. The balance wheel assembly further carries a means for driving an index wheel or gear so as to impart motion to the train of the watch. In order to prevent overbanking, various known expedients have been resorted to.

In the foregoing type of watch, the contact, index and overbank mechanisms are distinct and separate and require rather precise alignment in relation to one another in order to assure proper operation of the watch. This alignment must initially be performed at the factory and thereby adds a not insubstantial cost item to the price of the watch.

According to the present invention, it has now been found that through the use of a unique mechanism, it is possible to combine the contact, index and overbank mechanisms in such a manner that when the overall system is assembled, no final adjustment is necessary because all of the parts are self-aligning.

It is accordingly a primary object of the present invention to provide a contact, index and overbank mechanism for a battery operated electric watch which is simple in construction and which, when assembled, requires no final adjustment.

It is another object of the invention to provide in a battery operated electric watch a unitary contact, index and overbank prevention system which is self-aligning.

It is still another object of the invention to provide in a battery operated electric watch a unitary contact, index and overbank preventing system which is self-aligning and eliminates process steps in the manufacture of such watches.

These and further objects and advantages of the invention will become more apparent upon reference to the following specification and claims and appended drawings wherein:

FIGURE 1 is a plan view showing a contact, index and overbank prevention system constructed according to the present invention; and

FIGURE 2 is a vertical section taken along the line 2—2 of FIGURE 1.

Referring more particularly to the figures of the drawing, a balance staff **10** carrying a balance wheel **12** is mounted in a pillar plate **14** in a conventional manner. The balance staff also carries an insulating index roller **16** in which a high conductivity contact member **18** is mounted. The contact member **18** may be of any high conductivity metal but is preferably a precious metal such as gold alloy. This contact pin is connected by

means of a connection **20** to a coil carried by the balance wheel as is described in detail in assignee's aforementioned copending application. The other terminal of the coil is connected to the hairspring and thence to the battery circuit. The index roller **16** is attached to a sleeve **22** which also carries a safety roller **24** having a crescent shaped cutaway portion **26** as seen in FIGURE 1.

A pallet **28** is pivoted to the pillar plate at **30** and is provided with a forked end **32** which surrounds the contact and index pin **18** in the position shown in FIGURE 1. A guard pin **34** is attached to the bottom of the forked end **32** of the pallet **28** and is adapted to enter the crescent shaped cutaway portion **26** of the safety roller **24**. A pair of magnetic banking pins **36** and **38** are mounted on either side of the forked end of the pallet in insulating sleeves **40**.

The other end of the pallet **28** is provided with arms **42** and **44** carrying pins **46** and **48** at the ends thereof. The upper pin **46** in FIGURE 1 is formed of an insulating material, preferably a jewel such as sapphire. The lower pin **48** is formed of a wear resistant, conductive metal such as steel. The pins **46** and **48** are adapted to engage the saw tooth shaped teeth of an index wheel **52** journaled in the pillar plate on a shaft **54**. This index wheel is geared to the watch train, not shown. The index wheel **52** is mounted on the staff **54** on an insulated bushing **55** as is seen in FIGURE 2 in order to maintain the integrity of the electrical circuit.

Resiliently urged against the teeth **50** of the index gear **52** is the end **56** of a stabilizer spring **58** mounted on an insulating block **60**. The spring end **56** has an arcuate inner edge **62** containing a pair of notches **64** and **66** which are adapted to engage the ends of the teeth **50** of the index wheel **52**. The other end of the stabilizer spring terminates in a slotted portion **68** which is oriented on the block **60** by means of a pair of pins **70** and **72** and which is secured in position by means of a screw **74**. The underside of the screw **74** makes contact with a connector **76** which is connected to the battery in the watch. The block **60** is itself secured to the pillar plate in any suitable manner such as by the pair of screws **78** and **80**.

In operation, as the balance staff and index roller **16** oscillate in a counterclockwise direction, the index and contact pin **18** makes mechanical engagement and electrical contact with the inner surface of the forked end **32** of the pallet **28** and moves the pallet in a clockwise direction. This brings the metal pin **48** into engagement with the teeth **50** of the index wheel **52**, thereby completing a circuit to the coil carried by the balance wheel through the index wheel, stabilizer spring **58** and connection **76**. This causes the coil to be impulsed to move the balance staff further in a counterclockwise direction, whereupon the contact and index pin **18** clears the forked end **32** of the pallet **28**.

The banking pins **36** and **38** are of magnetic material and cause the pallet to finish its action after it has moved the index wheel through its specific arc and retains the pallet as the balance staff completes its cycle of oscillation. If the balance wheel overbanks, that is, rotates through an angle of excess amplitude, the contact and index pin **18** strikes the outside contour of the forked end of the pallet, which is held against the banking pin **36** to prevent further oscillation.

As the balance staff and associated index roller **16** rotates in the clockwise direction, the pallet is caused to rotate counterclockwise thereby bringing the insulated pin **46** into engagement with the teeth of the index wheel. This does not complete a circuit to the coil but does carry out the indexing function as well as provide for overbank prevention. The outside surface of the forked end of the pallet is insulated by any suitable coating in order

to prevent contact from being made at the time that the contact and index pin might strike the pallet during overbank prevention.

The pins 46 and 48 actuate the index wheel 52, so that it turns in a counterclockwise direction only and moves until the stabilizer spring reaches the tip of the next tooth. At this time the stabilizer spring takes over the rotation of the index wheel until the spring seats itself on the next tooth automatically positioning the index wheel for the next pin on the pallet.

It will be apparent from the foregoing that by utilizing the arrangement of this invention, the functions of the contact system, index system and overbank prevention system are combined in a unitary mechanism which possesses the following advantages: Indexing is positive to thereby provide a smooth running second hand. A definite contact time is established for energizing the coil without the need for contact adjustment. The overbank mechanism is simplified and is provided as a part of the contact and indexing mechanism. Through the use of a pallet it is possible to utilize a conventional design roller, jewel pin, forked slot and banking pin. Thinner watch construction is possible and final adjustment is eliminated.

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. In a battery operated electric watch having a balance staff carrying one element of a magnetic impulsing system and having the other element of said system carried by the watch frame, one of said elements adapted to be periodically energized by said battery, and having a train driven by an index wheel, the improvement comprising; a pallet mounted on said frame for rocking movement and having one end adapted to mechanically engage said index wheel during said rocking movement to advance said index wheel in one direction; means on said balance staff for engaging the other end of said pallet to impart said rocking movement as said balance staff oscillates, said pallet rocking in alternate directions upon oscillation of said balance staff in alternate directions, said last named means being arranged to provide electrical contact between said pallet and one of said elements during rocking motion of said pallet, said end of said pallet adapted to engage said index wheel being so arranged as to make electrical contact therewith as said pallet rocks in one direction only; and magnetic means cooperating with said pallet to maintain said one end in contact with said index wheel until separated therefrom upon oscillation of said balance staff in a direction opposite to that causing said pallet to rock in said one direction.

2. A battery operated electric watch as set out in claim 1 wherein said one end of said pallet is bifurcated to form a pair of arms, each of said arms carrying a pin for engagement with said index wheel, one of said pins being electrically conducting and the other being electrically insulating.

3. A battery operated electric watch as set out in claim 2 wherein said other end of said pallet is forked and cooperates with a conducting contact member and index pin carried by said balance staff.

4. A battery operated electric watch as set out in claim 3 including a stabilizer spring engaging said index wheel and establishing electrical contact from said stabilizer through said index wheel and pallet to said contact member when said contact member engages said forked end of said pallet.

5. A battery operated electric watch as set out in claim 1 wherein said other end of said pallet is forked and cooperates with a conducting contact member and index pin carried by said balance staff.

6. A battery operated electric watch as set out in claim 5 including a stabilizer spring engaging said index wheel and establishing electrical contact from said stabilizer through said index wheel and pallet to said contact member when said contact member engages said forked end of said pallet.

7. A battery operated electric watch as defined in claim 1 wherein said magnetic means cooperates with said other end of said pallet to prevent multiple indexing and contacting.

8. A battery operated electric watch having a balance staff carrying one element of a magnetic impulsing system and having the other element of said system carried by the watch frame, one of said elements being adapted to be periodically energized by said battery; a balance wheel mounted on said balance staff; a train; an index wheel for driving said train; means mounted on said frame for rocking movement and having one end adapted to mechanically engage said index wheel during said rocking movement to advance said index wheel in one direction; means on said balance staff for periodically engaging the other end of said mounted means to impart said rocking movement as said balance staff oscillates, said last mentioned means being arranged to provide electrical contact between said mounted means and one of said elements during rocking motion of said mounted means, said one end of said mounted means being so arranged as to make electrical contact with said index wheel as said mounted means rocks in one direction only.

9. The watch defined in claim 8 wherein said one end of said mounted means carries two pins, one of which is electrically conductive for engagement with said index wheel as said mounted means rocks in said one direction, the other of which is electrically insulated for engagement with said index wheel as said mounted means rocks in the other direction.

10. The watch defined in claim 8 including a stabilizer spring engaging said index wheel and establishing a constant electrical connection from said battery to said index wheel.

11. The watch defined in claim 10 including means mounted on said frame and cooperating with said other end of said mounted means to restrict said balance staff from multiple indexing and contacting.

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