

- [54] **BALANCE WHEEL AND STARTING LEVER ASSEMBLY OF TIME PIECE**
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- [58] Field of Search58/107, 117, 74,
58/78, 79, 22.9

[56] **References Cited**

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[57] **ABSTRACT**

Indentations provided on the periphery of the balance wheel of a time piece are engageable by a starting spring carried on one end of a starting lever actuated by a push-pull movement of the winding stem to stop the time piece with the balance wheel angularly displaced from neutral position. Preferably two indented portions are provided at diametrically opposite sides of the balance wheel.

8 Claims, 2 Drawing Figures

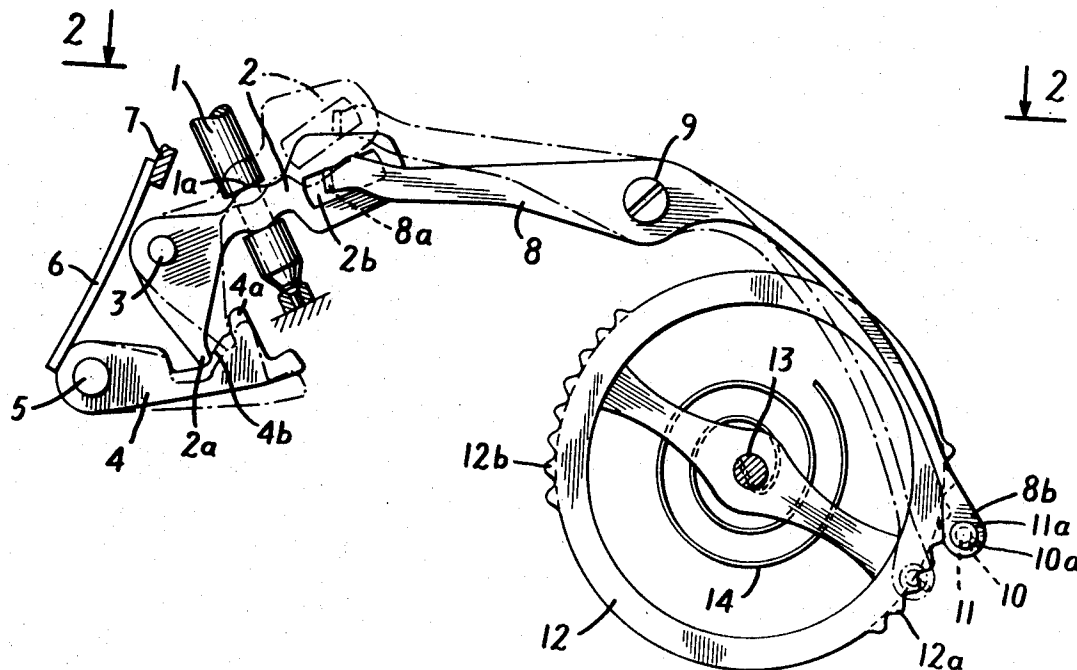


FIG. 1

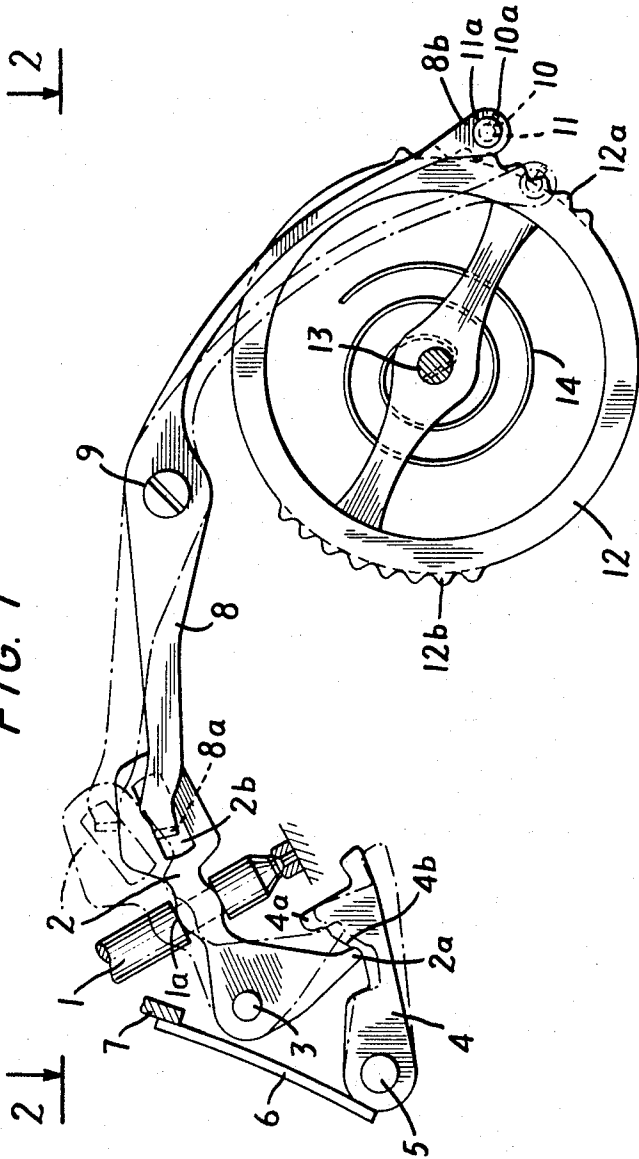
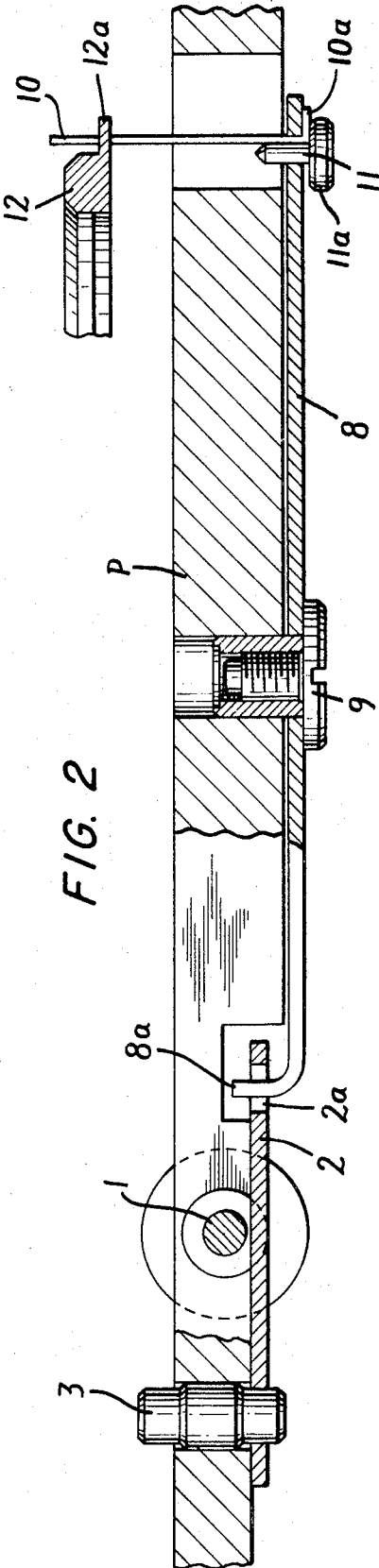


FIG. 2



BALANCE WHEEL AND STARTING LEVER ASSEMBLY OF TIME PIECE

BACKGROUND OF THE INVENTION

This invention relates to the start and stop mechanism of a time piece and more particularly to a balance wheel and starting lever assembly.

DESCRIPTION OF PRIOR ART

Conventional starting lever assemblies in stop-watches or chronographs for stopping the balance wheel at a predetermined position have employed a starting lever to stop the balance wheel at a predetermined position by engagement of a cam shaped projection on the balance wheel. However, in a mechanism of this kind, excessive lateral stresses are exerted on the pivots of the balance staff with the result of breaking or damaging the pivots. Another mechanism has been devised in which a pin provided on the balance wheel engages a spring portion of the starting lever to stop the balance wheel. In such a mechanism however, the balance wheel cannot be stopped at a predetermined position each time because the stop position of the balance wheel depends on its rotational direction.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an improved simple starting lever assembly which is capable of stopping the balance wheel of a time piece without failure at a predetermined position.

In accordance with the present invention, the balance wheel of a time piece is provided on its periphery with at least one indented portion comprising a plurality of concavely curved indentations alternating with convexly curved projections. A flexible starting spring carried on one end of a pivotally mounted starting lever which is actuable by push-pull movement of the winding stem of a time piece is engageable with the indented portion of the periphery of the balance wheel to hold the balance wheel against rotation and thereby stop the time piece. The construction in accordance with the present invention makes it possible to start and stop the balance wheel without failure irrespective of the direction of rotation of the balance wheel because the indented portion or portions at the periphery of the balance wheel are engageable by the starting spring in either direction of rotation. Moreover, the starting lever assembly in accordance with the present invention eliminates the danger of breaking or damaging the pivots of the balance staff because lateral forces exerted on the balance staff are negligible. Preferably the balance wheel is provided at its periphery with two indented portions which are disposed symmetrically relative to one another so that the balance of the balance wheel is not affected. With this arrangement the balance wheel can be stopped in either of two positions both of which are angularly displaced from the neutral position of the balance wheel. It will be understood that the balance wheel and starting lever assembly in accordance with the present invention can be used in watches, stopwatches or chronographs and is particularly suitable for use in an electric watch driven by a contact switch in that it has the advantage that the starting lever assembly serves to switch the electric circuit because the balance wheel stops at a position spaced from the neutral position where the contact

switch remains open, thereby eliminating any special device for switching the electrical circuit.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects and features of the present invention will be more fully described in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic plan view of a balance wheel and starting lever assembly in accordance with the present invention; and

FIG. 2 is an enlarged schematic side view looking in the direction indicated by the line 2-2 in FIG. 1 but with portions broken away and shown in section.

DESCRIPTION OF PREFERRED EMBODIMENT:

In the drawings there are shown only those portions of a time piece which pertain to the present invention, it being understood that other portions of the time piece are in accordance with conventional or desired construction. With reference to FIGS. 1 and 2, a winding stem 1 which is movable axially to stop and start the time piece is provided with a reduced or grooved portion 1a in which a setting lever 2 pivotally mounted on the frame plate P by a pivot 3 is loosely inserted so as to be pivotally movable by axial movement of the winding stem. The setting lever 2 is provided with a projecting nose portion 2a which is engageable by a clutch lever 4 which is pivotally mounted on the frame plate P by a pivot 5 and is engageable by a leaf spring 6, one end of which is affixed to a support member 7 on the frame plate. The clutch lever 4 is biased in a direction toward the setting lever 2 by the spring 6 and has a projection 4a and a cam surface 4b engageable with the nose portion 2a of the setting lever. The cam surface 4b of the clutch lever 4 is contoured so as to retain the setting lever 2 in the position shown in solid lines in FIG. 1 or the position shown in broken lines. When between the two positions, the setting lever 2 is biased toward the solid line position.

A starting lever 8 is pivotally mounted on the frame plate P by an arbor 9 has an end portion bent up to form a tab 8a which is received in an aperture 2b provided at one end of the setting lever 2 so as to provide a loose pivotal connection between the starting lever 8 and the setting lever 2. At its other end, the starting lever 8 carries a starting spring 10 which extends through a hole in the starting lever and is secured by a wedge 11 forced into the hole. The starting spring 10 is shown in the form of a flexible spring wire which projects from the starting lever in a direction parallel to the pivotal axis of the starting lever and hence perpendicular to its plane of movement. At one end the starting spring 10 is provided with a portion 10a bent at right angles and engaged by the head portion 11a of the wedge 11 so as to position the starting spring 10 with respect to the starting lever 8.

The projecting end portion of the starting spring 10 lies adjacent the periphery of a balance wheel 12 which is mounted by means of a balance staff 13 for oscillation about an axis parallel to the pivotal axis of the starting lever 8. By virtue of the pivotal connection provided by the tab portion 8a, the starting lever 8 is movable by the setting lever 2 between the position shown in broken lines which the starting spring 10 is engaged with the periphery of the balance wheel 12 and the position shown in solid lines in which the starting spring 10 is free of the periphery of the balance wheel. The

periphery of the balance wheel 12 is provided with at least one indented portion comprising concave indentations alternating with convex projections. In the embodiment shown by way of example in the drawings, the balance wheel is provided with two such indented portions 12a and 12b disposed at opposite sides of the balance wheel. Upon engagement of an indented portion of its periphery by the starting spring 10, the balance wheel is held against oscillation. The indented portions 12a and 12b of the periphery of the balance wheel are so located that when either is engaged by the starting spring 10, the balance wheel 12 is stopped in a position angularly displaced from the neutral position to which it is biased by the usual hairspring 14. Each indented portion of the periphery of the balance wheel has at least two indentations and preferably has an angular extent of 30° to 90°. The indentations and intervening projections are rounded and symmetrical as to be engageable with the starting spring 10 in either direction of rotation of the balance wheel. By reason of the curved form of the indentations and projections, the starting spring 10 may ride over one or more projections before bringing the balance wheel to a stop. Hence, stresses involved in the sudden stopping of the balance wheel are avoided.

In the operation of the time piece, the setting lever 2, clutch lever 4 and starting lever 8 are normally in the positions shown in solid lines in FIG. 1 so that the starting spring 10 is out of engagement with the periphery of the balance wheel 12. When it is desired to stop the time piece, a pull-out movement of the winding stem 1 causes the setting lever 2 to rotate about its pivot 3 in a counterclockwise direction until the nose portion 2a of the setting lever becomes engaged with the projection 4a of the clutch lever 4, whereupon the setting lever is held in the position shown in broken lines. At the same time the starting lever 8 is rotated by the setting lever 2 from the solid line position shown in FIG. 1 to the position shown in broken lines thus bringing the starting spring 10 into engagement with an indented portion 12a or 12b on the periphery of the balance wheel thereby to stop oscillation of the balance wheel. If the starting spring 10 first engages smooth portion of the periphery of the balance wheel, the balance wheel is not stopped until indented portion on its periphery comes into engagement with the starting spring 10. Hence, the balance wheel is always stopped in a position displaced angularly from the neutral position to which it is biased by the hairspring 14. When it is desired to start the time piece again, the winding stem 1 is pushed in thereby rotating the setting lever 2 in a clockwise direction and the starting lever 8 in a counterclockwise direction to the solid line positions shown in FIG. 1 so as to disengage the starting spring 10 from the periphery of the balance wheel 12. The balance wheel will thereupon start oscillating due to the returning action of the hairspring 14.

While a preferred embodiment of the invention has been shown by way of example in the drawings it will

be understood that modifications may be made while still retaining the functions and advantages of the invention.

What we claim and desire to secure by letters patent is:

1. In a time piece, the combination of an oscillatable balance wheel, a hairspring biasing the balance wheel to neutral position, said balance wheel having a selected portion of its periphery indented to provide a plurality of concavely curved indentations alternating with convexly curved projections, a pivotally mounted starting lever, a starting spring carried on one end of said starting lever, and means for manually moving said starting lever between an engaged position in which said starting spring engages said indented portion of the periphery of said balance to hold said balance wheel against rotation and a disengaged position in which said starting spring is disengaged from said balance wheel to permit oscillation thereof.

2. In a time piece, the combination according to claim 1, in which said indented portion is disposed in a position circumferentially of the periphery of the balance wheel to hold said balance wheel in a position angularly spaced from said neutral position when said indented portion is engaged by said starting spring.

3. In a time piece, the combination according to claim 2, in which said balance wheel has two said indented portions at opposite sides of its periphery.

4. In a time piece, the combination according to claim 1, in which the pivotal axis of said starting lever is approximately parallel to the axis of oscillation of said balance wheel.

5. In a time piece, the combination according to claim 4, in which said starting spring projects from said starting lever in a direction approximately parallel to the pivotal axis of said lever.

6. In a time piece, the combination according to claim 5, in which said starting spring extends through a hole in said starting lever and is secured by wedge means forced into said hole.

7. In a time piece, the combination according to claim 1, in which said means for manually moving said starting lever comprises an axially movable winding stem, a pivotally mounted actuating lever engaged by said winding stem and means pivotally connecting said actuating lever with an end of said starting lever opposite the end carrying said starting spring.

8. In a time piece, the combination according to claim 7, further comprising a pivotally mounted clutch lever and means biasing said clutch lever into engagement with said actuating lever, said actuating lever having a nose portion and said clutch lever having cam means engageable with said nose portion to retain said actuating lever in end positions corresponding to engaged and disengaged positions of said starting lever and to bias said actuating lever toward a position corresponding to the disengaged position of said starting lever when between said positions.

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