

STRUCTURE OF A MAINSPRING FOR A HAND WINDING MECHANICAL WATCH

[Detailed Description of the Invention]

[Field of the Invention]

The present invention relates to a wrist watch or similar mechanical watch having a mainspring and, more particularly, to an improvement in or relating to the structure of a hand-winding mainspring included in such a watch.

[Description of the Background Art]

To better understand the present invention, a brief reference will be made to the structure of a conventional hand-winding mainspring included in a mechanical watch, shown in FIGS.3(A)-3(D). As shown, a mainspring 10 is disposed in a barrel drum 12. A barrel arbor 14 is positioned at the center of the drum 12 and rotatable about its own axis. FIGS.3(A) and 3(B) show the mainspring 10 in its unwound position and its wound position, respectively. As shown in FIG.3(C), the barrel arbor 14 is formed with a lug 14A while the mainspring 10 is formed with a hole 10A in its inner end portion. The mainspring 10 is anchored to the arbor 14 with the hole 10A mating with the lug 14A. As shown in FIG.3(D), the drum 12 has a recess 12A in its inner wall while the mainspring 10 has an outer end portion 10B bent in the form of letter V. The mainspring 10 is anchored to the drum 12 with the V-shaped outer end portion 10B received in the recess 12A. A barrel complete 16 is formed on the outer wall of the drum 12.

When the mainspring 10 is wound, the arbor 14 is engaged with a

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rotated relative to the drum 12. As a result, the mainspring 10 is wound from the position shown in FIG.3(A) to the position shown in FIG.3(B). On the other hand, the resilient restoring force of the mainspring 10 acts on the drum 12 and causes it to rotate. The rotation of the drum 12 is transferred to a minute hand and hour hand via a wheel train including a minute wheel and an hour wheel.

FIGS.3(E) and 3(F) show a self-winding mainspring 10. As shown, a sliding attachment 20 is so positioned as to press the outermost turn 10C of the mainspring 10 against the inner wall of the barrel drum 12. Although the outermost turn 10C contacts the sliding attachment 20 and slidably contacts the inner wall of the drum 12, the former and the latter are shown as being slightly spaced from each other for distinction.

An oscillating weight, not shown, is mounted on the barrel arbor 14 and allows the mainspring 10 to wind automatically due to its motion. Assume that excessive energy is applied from the oscillating weight to the mainspring 10 having been fully wound. Then, the arbor 14 is rotated, and the entire mainspring 10 is rotated. At this instant, the outermost turn 10C of the mainspring 10 pressed against the drum 12 is caused to slide on the drum 12. As a result, the excessive energy is released and prevented from damaging the constituent parts of the watch.

The conventional hand-winding mechanical watch shown in FIGS.

constituent parts is apt to break. This is particularly true when a person accustomed to a battery-powered electronic watch, which is predominant today, uses the hand-winding mechanical watch.

It is therefore an object of the present invention to provide a new and useful structure of a hand-winding mainspring for a mechanical watch, and capable of allowing the user to clearly sense the degree of winding and surely releasing excessive energy, if applied to the mainspring, to thereby protect constituent parts from damage.

[Means for Solving Problem]

[Disclosure of the Invention]

In order to achieve the above object, the present invention is characterized by comprising a barrel drum, a barrel arbor rotatably mounted on said barrel drum, a hand-winding mainspring wound by the rotation of a barrel arbor, and a sliding attachment adjoining the outer end of the mainspring and pressing, when the mainspring is received in the barrel drum, the radially outermost turn of the mainspring slidably against the inner wall of the barrel drum. The slip torque of the outermost turn of the mainspring contacting the inner wall of the barrel drum is selected to be greater than 1.5 times, inclusive, as great as the output torque of the mainspring.

In a preferred embodiment, the slip torque of the mainspring is selected to be 2.0 times to 5.0 times as great as the output torque of the mainspring.

of the mainspring on the drum. As a result, the following advantages are achievable.

(1) When the operator winds the mainspring by hand the resistance sequentially increases. As the mainspring approaches its fully wound position, the operator feels a crown heavy and senses the wound condition of the mainspring.

(2) Even when excessive energy is applied to the mainspring reached its fully wound position, it is successfully released and does not damage the constituent parts.

The above and other objects, features and advantages will become apparent from the following detailed description taken with the accompanying drawings.

[Form of Embodiment of the Invention]

How the present invention is embodied will be described in detail with reference to an embodiment. Structural elements corresponding to those of the background art will be designated by like reference numerals.

[Embodiment]

Referring to FIGS.2(A)-2(D), a mainspring embodying the present invention is shown and generally designated by the reference numeral 30. As shown in FIG.2(A), the mainspring 30 is generally configured in the form of letter S. As shown in FIG.2(B), the mainspring 30 has an inner end 32 formed with a hole 34. The hole 34 mates with a lug 14A

indicated by an arrow in FIG.2(C). As shown in FIG.2(D) , the sliding attachment 38 is welded to the mainspring 30 as at 40.

The sliding attachment 38 has bent portions 38A and 38B at its opposite ends. The bent portions 38A and 38B allow the attachment 38 to follow the curvature (R) of the inner wall 12B of a barrel drum 12 (see FIGS.1(A)-1(D)), thereby implementing a stable slip torque.

As shown in FIG.1(A), the mainspring 30 is wound in a flat helical configuration and then received in the barrel drum 12 such that the sliding attachment 38 presses the radially outermost turn 30A of the mainspring 30 against the inner wall 12B of the drum 12. At this instant, the lug 14A of the barrel arbor 14 is received in the hole 34 of the mainspring 30. The turn 30A of the mainspring 30 slidably contacts the inner wall 12B of the drum 12. FIG.1(B) shows the mainspring 30 received in the drum 12 in the above condition. FIG.1(D) is a section along line #1-#1 of FIG.1(B). In FIGS.1(B) and 1(C), the turn 30A of the mainspring 30 is shown as been spaced from the sliding attachment 38 and the inner wall 12B of the drum 12 in order to promote the understanding of the embodiment.

As stated above, the sliding attachment 38 is associated with the hand-winding mainspring 30 as distinguished from a self-winding mainspring. In the illustrative embodiment, the resistance to the slip between the turn 30A of the mainspring 30 and the inner wall 12B of the drum 12 and ascribable to the attachment 38, i.e., the slip torque is

great as the output torque of the mainspring which is assumed to be 1. By contrast, in the illustrative embodiment, the attachment 38 makes the slip torque to 2.0 times to 3.0 times as great at the output torque of the mainspring 30 which is also assumed to be 1. This can be done only if the attachment 38 has its width W (FIG.2(D)), thickness t (FIG.2(C)), length L (FIG.2(A)) and material adequately selected.

The timepiece with the mainspring 30 will be operated as follows. Assume that the user turns a crown, not shown, in order to wind the mainspring 30. Then, the barrel arbor 14 is rotated in a direction indicated by an arrow F1 in FIG.1(B). As a result, the mainspring 30 is wound from the unwound position shown in FIG.1(B) to the fully wound position shown in FIG.1(C).

Assume that the user has further turned the crown, not noticing the fully wound position of the mainspring 30. Then, the user feels the crown heavy. At the same time, the outermost turn 30A pressed against the inner wall 12B of the drum 12 by the sliding attachment 38 tends to slide on the wall 12B. However, the turn 30A is prevented from sliding on the wall 12B because the slip torque between the former and the latter is great, as stated earlier. This obstructs the rotation of the crown and allows the user to sense the fully wound position of the mainspring 30.

If the user turns the crown more strongly by accident, then the user's force overcomes the slip torque between the turn 30A of the

the constituent parts of the watch from damage.

As stated above, in the illustrative embodiment, the sliding attachment 38 increases the slip torque of the mainspring 30 despite that the mainspring 30 is wound by hand. The increased slip torque allows the user of the watch to sense the fully wound position of the mainspring 30 immediately. In addition, excessive energy which may act on the mainspring 30 can be released to protect the constituent parts from damage.

[Other Embodiments]

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof. Examples are as follows.

(1) In the embodiment shown and described, the slip torque of the mainspring 30 and derived from the sliding attachment 38 is selected to be 2.0 times to 3.0 times as great as the output torque of the mainspring 30. While a small slip torque is desirable in the aspect of the damage to the constituent parts, it is undesirable from the user's sensibility standpoint. Experiments showed that the slip torque should preferably be more than 1.5 times inclusive, more preferably more than 2.0 times inclusive, as great as the output torque of the mainspring 30.

As for the upper limit of the slip torque, the constituent parts can be protected from damage so long as the mainspring 30 slides. For

achieved when the slip torque was more than 1.5 times inclusive, preferably more than 2.0 times inclusive, as great as the output torque of the mainspring 30. Particularly, the slip torque should desirably be 2.0 times to 5.0 times as great as the output torque of the mainspring 30.

(2) The mechanism between the crown and the drum 12 and the mechanism between the drum 12 and the hands may each be implemented by any of conventional arrangements.

[Brief Description of the Drawings]

[FIG.1]

shows the structure of a mainspring embodying the present invention and its operation.

[FIG.2]

shows the configuration of the mainspring.

[FIG.3]

shows a conventional structure of a mainspring.

[List of Reference Numerals]

- 10 mainspring
- 10A hole
- 10B bent portion
- 10C outermost turn
- 12 barrel drum
- 12A recess
- 14 barrel arbor
- 14A lug
- 16 barrel complete
- 20 sliding attachment
- 30 mainspring
- 30A outermost turn
- 32 inner end
- 34 hole
- 36 outer end
- 38 sliding attachment



【Claims】

【Claim 1】 A structure of a mainspring for a hand-winding mechanical watch, comprising:

a barrel drum;

a barrel arbor rotatably mounted on said barrel drum;

a hand-winding mainspring wound by rotation of said barrel arbor;

and

a sliding attachment adjoining an outer end of said mainspring and pressing, when said mainspring is received in said barrel drum, a radially outermost turn of said mainspring slidably against an inner wall of said barrel drum;

wherein a slip torque of said radially outermost turn of said mainspring is selected to be more than 1.5 times, inclusive, as great as an output torque of said mainspring.

【Claim 2】 A structure as claimed in claim 1, wherein a slip torque of said radially outermost turn of said mainspring is selected to be 2.0 times to 5.0 times as great as an output torque of said mainspring.