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F. H. SMYTHE, JR., ET AL
HOROLOGICAL HAIRSPRING DEVICE

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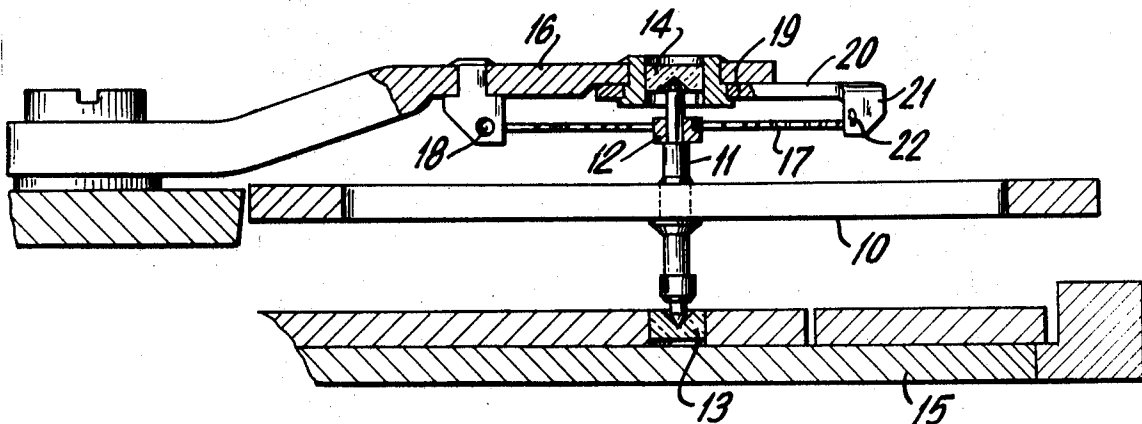


FIG. 1

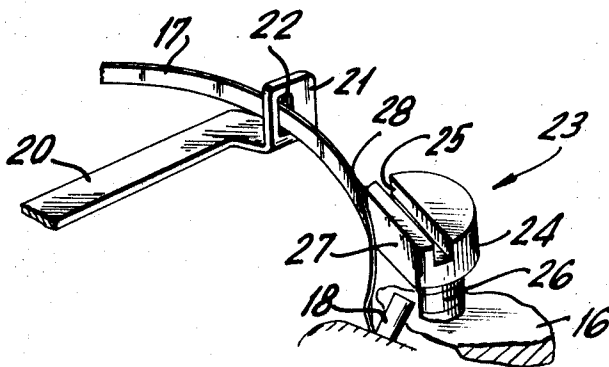


FIG. 2

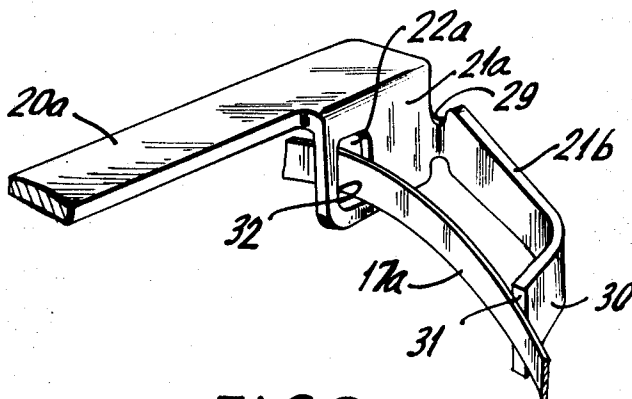


FIG. 3

INVENTORS
FREDERIC H. SMYTHE, JR.
EDWARD KAULINS
BY

Davis, Horie, Faithfull & Haggood
ATTORNEYS

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HOROLOGICAL HAIRSPRING DEVICE

Frederic H. Smythe, Jr., Watertown, and Edward Kaulins,
New Milford, Conn., assignors to Timex Corporation,
a corporation of Delaware

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6 Claims

ABSTRACT OF THE DISCLOSURE

A horological instrument includes an oscillator assembly and a hairspring. The hairspring, at one end, is fastened to the oscillator assembly and at its opposite end it is anchored to the frame or bridge. A regulator touches the hairspring and is movable at least partly along its length. A pre-stressing device, which may be a separate component or a part of the regulator, contacts the hairspring between its fixed end and the regulator.

DESCRIPTION

The present invention relates to horology and more particularly to a device associated with the hairspring and regulator.

In many horological instruments the time base is an oscillator. The oscillator is connected to one end of a hairspring and the other end of the hairspring is attached to a fixed part of the instrument, for example, a frame plate or bridge. In many mainspring driven and electric watches, the oscillator is a balance wheel fastened to a balance wheel staff. The staff pivots in bearings or other pivot means.

The timekeeping accuracy of the instrument is dependent upon the balance wheel and its hairspring. For that reason great care is exercised in selecting the hairspring steel so that it is not adversely affected by temperature changes and aging.

A problem involving the hairspring system arises from the desire that when the horological instrument is sold it should be regulated so that it is an accurate timekeeper. One way to obtain such an initial accurate regulation is to place a watch on a timing machine, regulating it, allowing it to run for a while, for example, a few hours or days, and regulating it a second time. That procedure is time-consuming, costly and may require skilled personnel. In mass production, a watch is placed on a timing machine and the watch regulator moved into its supposedly correct position. However it has been found that the oscillator rate rapidly drifts off its setting. This rapid initial drift is possibly caused by a change in the position of the hairspring relative to the regulator. Possibly the hairspring initially rests on one or a few points on the internal surface of the regulator opening; but in its first few hours or days of running it wears down those points and thereby changes its position relative to the regulator.

It is the objective of the present invention to provide a device ancillary to the regulator which prevents drifting of the oscillator rate after the regulator is initially adjusted, thereby avoiding a readjustment of the regulator after its initial setting.

It is a further objective of the present invention to prevent a change in timekeeping due to the effect of the moving and vibratory hairspring on the regulator.

In accordance with the present invention, a horological instrument is provided in which an oscillator assembly is attached to a hairspring at its inner end. A device is positioned to contact the hairspring between the regulator and the outer fixed end of the hairspring. The device may be adjustable and, when adjusted, causes a pre-

stressing of the hairspring against the regulator. In one embodiment the device is on a fixed part of the movement. In a second embodiment the device is connected with, or a part of, the regulator. When the device is connected with, or integral with, the regulator, it provides a constant pre-stress to the hairspring regardless of the position of the regulator.

Other objectives of the present invention will be apparent from the following detailed description giving the inventor's best mode of practicing the invention, the description being taken in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is a side view, partly in cross-section, of the balance wheel and hairspring;

FIG. 2 is an enlarged perspective view of the first embodiment of the present invention; and

FIG. 3 is a perspective view of the second embodiment of the present invention.

The horological instrument is described in a wrist watch, although the present invention is applicable to other horological instruments using an oscillator and a hairspring.

As shown in FIG. 1, the watch movement includes a balance wheel 10 which is fixed on a balance wheel staff 11. A hub 12 is also fixed on staff 11. The staff pivots between pivots 13 and 14 in frame plate 15 and bridge 16, respectively. A hairspring 17 is connected, at its inner end, to the hub 12. The hairspring 17, at its outer end, is connected to the bridge by means of a wedge pin arrangement 18. A regulator 19 is rotatably mounted on bridge 16 above the pivot 14. The regulator 19 has a regulator arm 20 with an extension flange portion 21 having an opening 22 through which the hairspring passes.

As shown in FIG. 2, an adjustable device 23 is positioned between the regulator 20 and the wedge pin arrangement. The device 23 is a screw head 24 having a channel 25, a shank 26 with screw threads, and a flat side 27 on the head 24. The shank 26 screws in matching threads in a hole in the bridge 16. The adjustment of the device is obtained by turning the head 24 until shoulder 28 of side 27 touches the hairspring 17. The shoulder 28 pre-stresses the hairspring 17, that is, pushes the spring against the inner face of the opening 22. That force prevents movement of the spring relative to the regulator, thereby preventing rate drift.

In operation, the head 24 is turned until it pushes the hairspring 17. The watch is placed on a timing machine and regulated by turning of the regulator 20. The watch will retain its initial rate without re-regulation in the process of its manufacture.

The second embodiment of the present embodiment is shown in FIG. 3. The environment of the device is the same as shown in FIG. 1. The regulator arm 20a has a flange portion 21a having an opening 22a for the hairspring 17a. A bendable arm 21b is joined with, or is integral with, the flange portion 21a at portion 29, the portion 29 being narrowed in width to permit bending. The free end 30 of arm 21b is curved inward and its end face 31 may touch and push spring 17a.

In operation, the operator bends arm 21b inward so that face 31 pushes the hairspring 17a against the inner face 32 of opening 22a. The watch is regulated by the moving of arm 20a.

We claim:

1. A horological device having a frame member and bridge, an oscillator assembly, a hairspring connected between the oscillator assembly and the bridge, and an adjustable regulator pivotally positioned on a frame member or bridge and having an arm positioned to contact

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the hairspring, and a hairspring pre-stressing device positioned on the bridge and adjustably positioned to contact and exert force on that portion of the spring which lies between the regulator and the fixed end of the spring.

2. The horological device as in claim 1 wherein the oscillator assembly includes a balance wheel and a hairspring hub fixed on a balance wheel staff.

3. The horological device as in claim 1 wherein the pre-stressing device is a screw head having a flat portion and a screw threaded shank, the shank screwing into a hole in a bridge.

4. A horological device having a frame member and bridge, an oscillator assembly, a hairspring connected between the oscillator assembly and the bridge, and an adjustable regulator pivotly positioned on the bridge and having an arm positioned to contact the hairspring, and a hairspring pre-stressing device connected with the regulator and adjustably positioned to contact and exert force on that portion of the spring which lies between the regulator and the fixed end of the spring

5. The horological device as in claim 4 wherein the

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pre-stressing device is an arm extending from the regulator arm, said extending arm having a narrowed portion to permit bending.

6. The horological device as in claim 4 wherein the oscillator assembly includes a balance wheel and a hairspring hub fixed on a balance wheel.

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RICHARD B. WILKINSON, Primary Examiner

20 S. A. WAL, Assistant Examiner