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REGULATING DEVICE FOR WATCHES

Original Filed Nov. 27, 1940

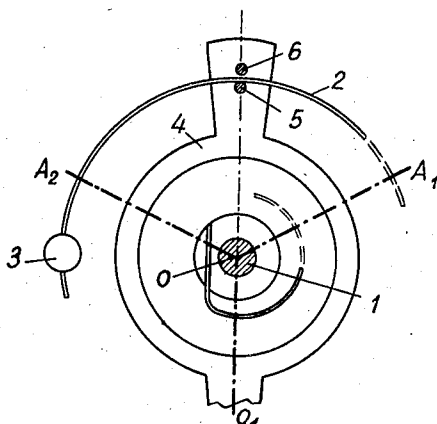


Fig. 1

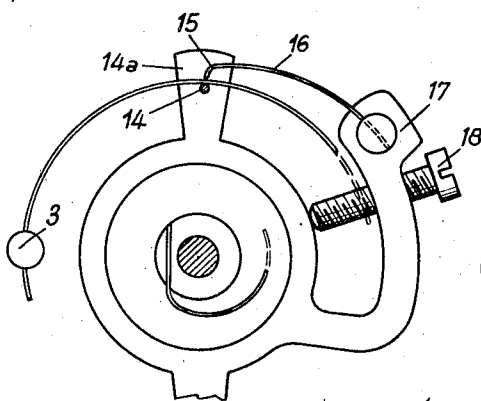


Fig. 2

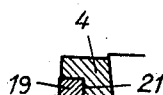


Fig. 4

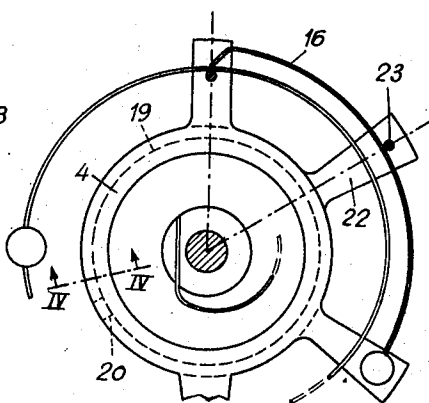


Fig. 3

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## UNITED STATES PATENT OFFICE

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## REGULATING DEVICE FOR WATCHES

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Original application November 27, 1940, Serial No. 367,480, now Patent No. 2,307,841, dated January 12, 1943. Divided and this application July 29, 1942, Serial No. 452,785. In Switzerland December 15, 1939

4 Claims. (Cl. 58—113)

The present application is a division of my co-pending application filed November 27, 1940, Serial No. 367,480, now Patent No. 2,307,841 granted January 12, 1943.

The present invention relates to a regulating device for watches of the type having a balance wheel and a spiral spring or hairspring for this balance wheel.

The object of this invention is to provide such a regulating device as to permit the active length of the hairspring to be automatically increased when the amplitude of the balance wheel exceeds a predetermined value, in order that the increase of the period due to the increase of length of the hairspring compensates for the diminution of the period due to the increase of amplitude.

The invention consists of novel features which will be more fully described hereinafter and then pointed out in the appended claims.

The accompanying drawing represents an usual regulating device and two embodiments of the invention.

Fig. 1 is a diagrammatical plan view of the usual regulating device.

Figs. 2 and 3 are diagrammatical plan views illustrating each one of the embodiments.

Fig. 4 is a sectional view on line IV—IV of Fig. 3.

In Figure 1, the reference character 1 indicates the axle of the balance wheel, and 2 indicates the spiral spring or hairspring, the inner extremity of which is fixed by a ferrule to the said axle, while the outer extremity is fixed to the ring hook 3 which is itself fixed to the frame. 4 is the regulator lever which may be turnable about the axle of the balance wheel and which carries two pins 5 and 6 between which passes the spiral spring. The active length of the spiral is comprised between the said pins and the inner end of the spiral.  $OO_1$  indicates the position of rest of the balance wheel.  $OA_1$  indicates the extreme right hand position and  $OA_2$  the extreme left hand position. The angle  $O_1—OA_1$  or  $O_1—OA_2$  is the amplitude, and  $T$  may be the period or time required by the balance wheel to travel from  $OA_1$  to  $OA_2$ .

As already known, this period  $T$  depends also upon the active length of the hairspring and is raised with the length, a fact which permits of general retouching of the balance wheel-spiral system by turning the regulator lever in clockwise or counterclockwise direction. Further, it is known that in the case the balance wheel oscillates alone, its oscillations are isochronous the period  $T$  being thus independent of the ampli-

tude, while when the balance wheel is combined with an escapement the face of things changes. Generally the effect of the escapement is to diminish the period in the event of great amplitudes so as to cause the watch to advance while in the event of small amplitudes it increases the period thus causing the watch to retard. On the other hand upon winding up of the watch maximum amplitudes of the balance wheel are obtained because in that moment the escapement acts with maximum force upon the balance wheel. The result of this arrangement is that a watch barrel of 24 hours advances in the morning and retards at night, so that finally, at the end of the day, the watch will indicate the exact time. However, in cases of watches having a barrel of eight days or even thirty days the advancing will continue several days through and the advancing of the first day will be added to the advancing of the following days thus causing differences of an inadmissible extent.

The embodiment hereinafter described aims to overcome these inconveniences.

In the embodiment of Fig. 2, the outer end section of the hairspring passes between a rigid pin 14 arranged inside the hairspring on an arm 14a and an elastic abutment member 15 disposed outside the hairspring and formed by the free end of a blade spring 16 inserted at its other end into a cranked arm 17 of the regulator lever, said latter cranked arm being slightly elastic. A screw 18 is provided to permit adjusting of the point of engagement of the blade spring with the hairspring and thus the active length of the latter.

Normally, the hairspring is slightly clamped between the pin 14 and the blade spring 15 and its active length terminates in this point. When the amplitude is raised the hairspring when opening gets off the pin 14 and bends the blade spring 15; the elasticity of the latter must be of such a value as to permit said blade spring to readily yield up to the pressure of the hairspring; on the other hand, the elastic strain of the blade spring may be a multiple of that produced by the section of the hairspring extending from the abutment members 14 and 15 to the fixed point 3. In this way the operation takes place as if the hairspring were connected only to the blade spring 16, and its active length is increased for the active length of said blade spring.

In the embodiment of Fig. 3, there is provided a ring 19 split as at 20 and adapted to turn in a circular recess 21 of the regulator lever 4. The ring 19 is formed integral with an arm 22 to

which is fixed an abutment pin 23 disposed outside the blade spring 16 and bearing thereagainst. When moving this abutment pin alongside the blade spring, the active length of the latter is varied.

What I claim is:

1. A watch regulator comprising a hairspring for a balance wheel, a pivoted regulator lever for said hairspring, said lever being formed with an arm extending radially therefrom and with a second arm also extending radially therefrom and disposed in spaced angular relation to said first arm, a fixed curb member secured to said first arm and bearing only against the inner side of the outer coil of said hairspring, a blade spring secured at its one end to said second arm, said blade spring extending peripherically to said outer coil of the hairspring and bearing with its free end only against the outer side of said coil, the elasticity of said blade spring being of such a value as to permit said blade spring to readily yield up under the pressure of said coil, said coil being adapted by its expansion to move away from said inner fixed curb member and to be curbed merely by said blade spring, whereby to have its operative length automatically increased to an extent corresponding to the active length of said blade spring.

2. A watch-regulator as claimed in claim 1, wherein there is provided a means for previously adjusting the active length of the blade spring.

3. A watch-regulator comprising a hairspring for a balance wheel, a pivoted regulator lever for said hairspring, said lever being formed with an arm extending radially therefrom and with a cranked arm disposed in spaced angular relation to said first arm and extending radially and peripherically from the regulator, said cranked arm being slightly elastic, a fixed curb pin secured to said first arm and bearing only against the inner side of the outer coil of said hairspring, a blade spring secured at its one end to the peripheral portion of said cranked arm, said blade spring extending peripherically to said hairspring

and bearing with its free end only against the outer side of said coil, the elasticity of said blade spring being of such a value as to permit said blade spring to readily yield up under the pressure of said coil, said coil being adapted by its extension to move away from said inner fixed curb pin and to be merely curbed by said blade spring whereby to have its operative length automatically increased to an extent corresponding to the angular distance between said inner curb pin and the engaged end of said blade spring, and a screw mounted in the cranked arm and bearing against the balance wheel for adjusting the engagement point of said blade spring with the hairspring for regulating the active length of the latter.

4. A watch-regulator comprising a hairspring for a balance wheel, a pivoted regulator lever for said hairspring, said lever being formed with two arms extending radially therefrom in spaced angular relation to each other, a fixed curb pin secured to the first one of these arms and bearing only against the inner side of the outer coil of said hairspring, a blade spring extending peripherically to said hairspring and secured at one of its ends to the second one of these arms and bearing with its free end only against the outer side of said coil, the elasticity of said blade spring being of such a value as to permit said blade spring to readily yield up under the pressure of said coil, said coil being adapted by its expansion to move away from said inner curb pin and to be curbed merely by said blade spring whereby to have its operative length automatically increased to an extent corresponding to the active length of said blade spring, a ring pivoted on said lever and formed integral with an arm extending radially therefrom between the arms of the regulator lever, an abutment pin secured to said arm and bearing against the outer side of said blade spring whereby determining the starting point of said blade spring and thus the active length thereof.

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