

July 23, 1940.

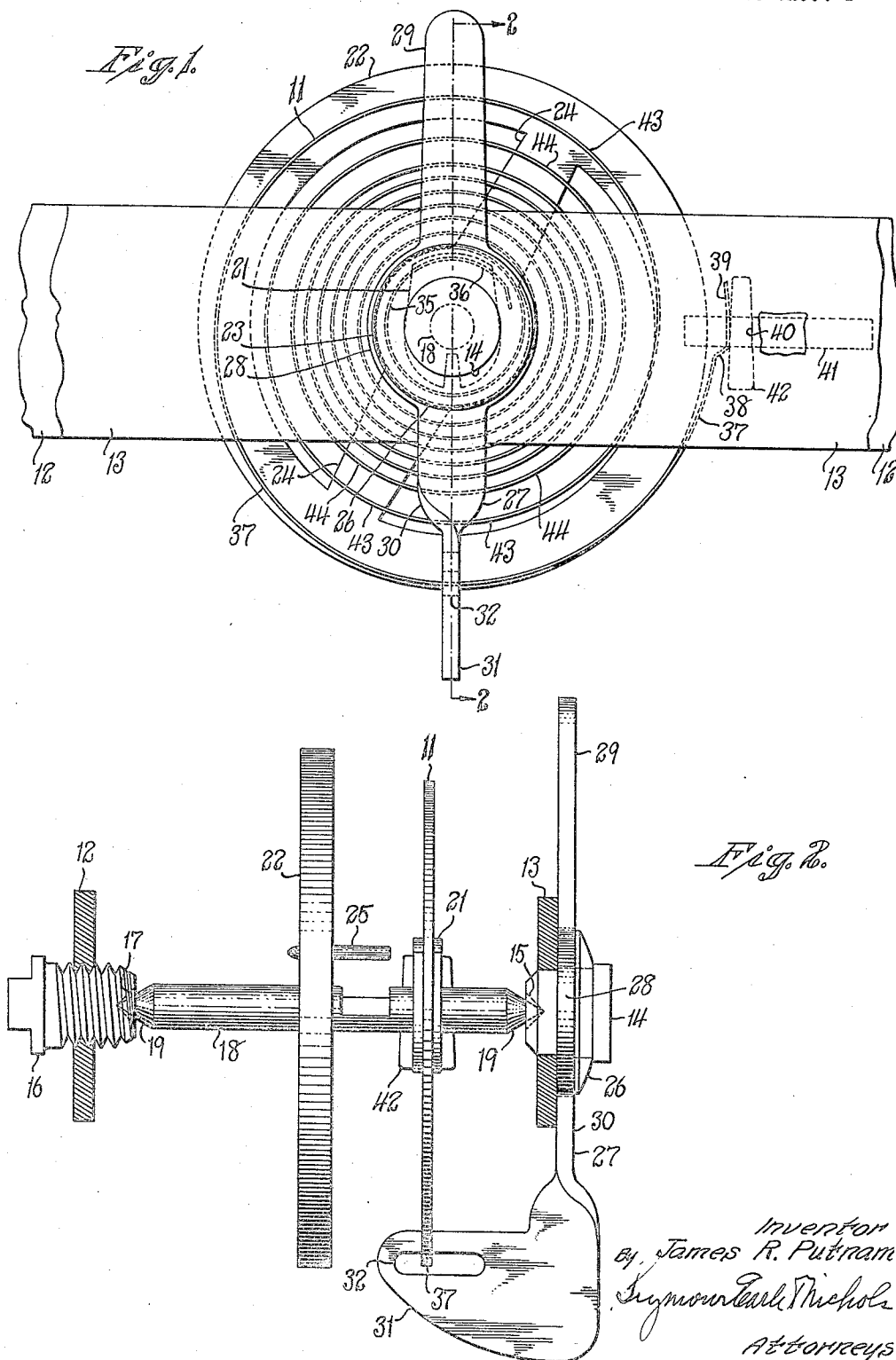
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HAIRSPRING FOR TIME INSTRUMENTS

Filed Sept. 19, 1938

2 Sheets-Sheet 1



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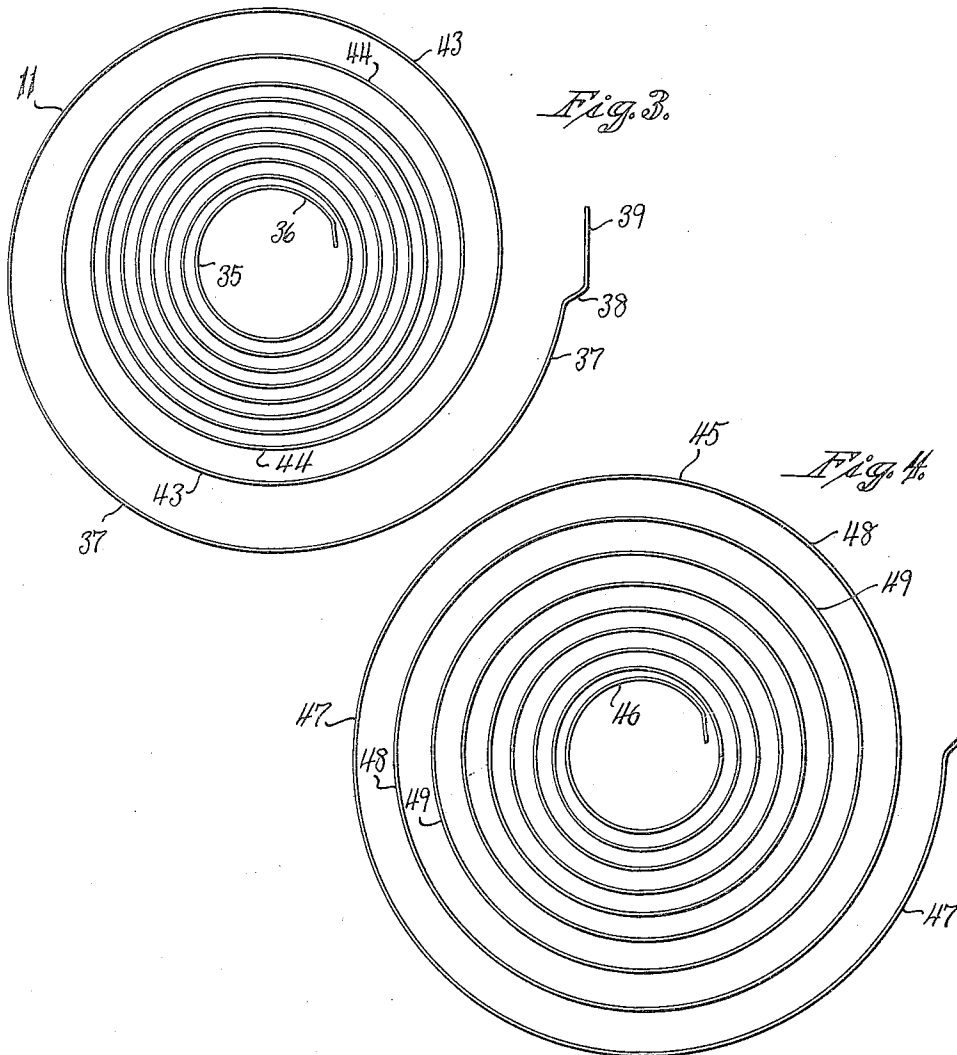
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HAIRSPRING FOR TIME INSTRUMENTS

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3 Claims. (Cl. 58--114)

The present invention relates to improvements in spiral hairsprings for measuring-instruments and more especially concerns a superior spiral hairspring for organization with the movement of a timepiece, such as a watch or a clock.

One of the objects of the present invention is to entirely or substantially eliminate a number of interferences affecting the precision of a time-instrument, whereby a time-piece featured by accuracy of high degree is obtained.

Another object of this invention is to provide improved means for maintaining substantially isochronous motion of a balance-wheel, whereby a time-movement of improved precision is secured.

A further object of this invention is to provide for organization with the movement of a time-piece a superior spiral hairspring so formed as to eliminate interferences affecting regulated isochronous motion of a balance-wheel, whereby a time-movement of superior precision characteristics, is obtained.

Still another object of the present invention is to organize with the movement of a time-instrument, a spiral hairspring of improved construction, whereby need for repairs and adjustments is substantially lessened and inconvenience and expense caused thereby are largely avoided.

A still further object of the invention is to provide a superior spiral hairspring for the purposes described which may be economically fabricated at little or no cost above the cost of spiral hairsprings currently produced.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a broken view in front elevation showing an escapement-mechanism for a timepiece embodying a spiral hairspring formed in accordance with the present invention;

Fig. 2 is a transverse sectional view thereof taken on the line 2--2 of Fig. 1 through the front and back plates;

Fig. 3 is a detached plan view of the spiral hairspring shown in Figs. 1 and 2; and

Fig. 4 is a similar view of a modified form of spiral hairspring.

In connection with the embodiments of the invention chosen for illustration, an escapement-mechanism is employed which may generally be of more or less conventional character but which is distinguished by the organization therewith of the spiral hairspring of the present invention, the said spiral hairspring being herein generally designated by the reference character 11.

As is shown particularly well in Fig. 2, the parts about to be described are supported by or between a front-plate 12 and a back-plate 13. Through an opening provided in the said back-plate 13 the shank of a bearing-stud 14 passes and the end-face of the shank is provided with a conical-recess which forms a bearing-seat 15. Aligned with and arranged opposite to the said bearing-stud 14 is a bearing-screw 16 the shank of which is threaded and is threaded through an opening in the front-plate 12. As described in connection with the bearing-stud 14 the bearing-screw 16 is provided in the end-face of its shank with a conical-recess which likewise forms a bearing-seat 17.

Rotatively supported in the bearing-stud 14 and the bearing-screw 16 for oscillating movement is a balance-staff 18. As is shown particularly well in Fig. 2 the said balance-staff 18 at its respective opposite ends is tapered to provide cone-bearings 19--19. One of the said cone-bearings 19 is received in the conical bearing-seat 15 of the bearing-stud 14. The other cone-bearing 19 enters the conical bearing-seat 17 in the bearing-screw 16 which is adjustable in the front-plate 12.

Staked on the balance-staff 18 is a collet or hairspring hub 21, the purpose of which will be described, and a balance-wheel 22. From its hub-portion 23 the balance-wheel 22 is cut-out radially to its outer edge at diametrically opposite portions thereof, providing two spokes 24--24.

Carried by the balance-wheel 22 is the usual impulse-pin 25 for engaging an impulse-lever connected with an escape-wheel, not shown, and a portion of the said balance-staff adjacent the hub-portion 23 of the balance-wheel is cut-out to provide clearance for the said impulse-lever.

Securely held in place against the forward face of the back-plate 13 by the head of the bearing-stud 14 and a friction-washer 26 engaged thereby, is a regulator-lever 27 for the said hairspring 11. The said regulator-lever 27 is preferably formed with a hub-portion 28 having an opening of larger diameter than the diameter of the opening in the front-plate 12. Against the front face of the hub-portion 27 around the said opening therein the rear face of the friction-washer 26 abuts. This friction-washer 26 may be composed of spring-material and its front face about the opening therein is engaged by the head of the said bearing-stud 14. As will be understood the shank of the bearing-stud 14 passes through the opening in the said friction-washer, through the opening in the regulator-lever and through the opening in the said front-plate.

Extending radially from the hub-portion 28 of the regulator-lever in opposite directions respectively are arms 29 and 30. At the distal end of the arm 29 the regulator-lever is quarter-turned

to provide a loop or tail-piece 31 which extends at substantially a right-angle to and rearwardly from the said arm 30. As shown the said loop or tail-piece 31 is provided with a slot 32 for receiving the outer convolution 37 of the spiral hairspring 11, as will be described more fully herein-after.

Coming now to the description of the improved spiral hairspring of the present invention, the terminal-portion 36 of the innermost spiral or convolution 35, as is shown particularly well in Fig. 1, is attached in any suitable manner to the collet or hub 21. The outermost convolution 37, as is shown in Figs. 1 and 2, passes through the slot 32 in the loop or tail-piece 31 of the regulator-lever 27. Adjacent its free end the said outermost convolution 37 is formed to provide a locating-bend 38 whereby an attaching-terminal 39 thereof can be located with respect to an opening 40 in a bracket-member 41 secured to the back-plate 13. As is shown, see Fig. 1, the attaching-terminal 39 is received in the said opening 40 and is held in place in the bracket-member 41 by means of a keeper or wedge-pin 42.

A feature of the present invention is the special arrangement of some of the convolutions of the spiral hairspring 11 with respect to other convolutions of the said hairspring.

As is particularly well shown in Fig. 3, in one embodiment of the invention the spiral hairspring 11 may be said to be comprised of a group of interiorly-arranged convolutions substantially uniformly spaced apart one from the other, and a group of outer convolutions which are spaced from each other relatively-widely with respect to the spacing between the convolutions of the said group lying interiorly thereof. In this illustrative example the outermost convolution 37 which for convenience will be called the first outermost convolution is more widely spaced from its adjacent convolution here to be referred to as the second outermost convolution 43 than the said second outermost convolution 43 is spaced from the next succeeding or third outermost convolution 44. Furthermore the spacing between the said second outermost convolution 43 and the said third outermost convolution 44 is wider than the spacing between the convolutions lying interiorly of the said third outermost convolution.

In Fig. 4 there is shown a modified form of spiral hairspring 45 in which substantially the same effect is secured as is obtained with the hairspring of the preceding figures, with respect to the spacing between outer and inner groups of convolutions of the spiral hairspring. In this embodiment of the invention the spacing between the adjacent convolutions of the spiral hairspring 45 progressively widens from the innermost convolution 46 to the first outermost convolution 47. As will be clear, the spacing between the said first outermost convolution 47 and the second outermost convolution 48 is relatively-wider than the spacing between the said second outermost convolution 48 and the third outermost convolution 49, which spacing in turn is relatively-larger than the spacing between adjacent coils lying interiorly of the said third outermost coil.

In the operation of an ordinary timepiece clashing occurs between convolutions of the spiral hairspring. This generally involves the first few outermost convolutions of the hairspring. Overriding of convolutions caused, for example, by shocks or jars also takes place. When such con-

ditions are present the hairspring will not properly perform its function of controlling the motion of the balance-wheel and this will result in non-uniform pulsations or impulses. Clashing of convolutions of the hairspring usually causes a timepiece to run fast.

Spiral hairsprings formed in accordance with the invention herein described eliminate the disturbing defect in timepiece operation caused by the clashing or overriding of convolutions of the hairsprings. By forming the few outermost convolutions more widely spaced from each other than are the remaining convolutions, these coils do not come into contact and the desired isochronous motion of the balance-wheel is maintained. In this manner not only is the precision of the timepiece improved but the need of frequent adjustments and repairs and inconvenience and expense caused thereby are also materially diminished.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. As a new article of manufacture, a spiral hairspring for time-instruments comprising two groups of spiral convolutions, one of the said groups being an inner group having the convolutions thereof substantially uniformly spaced apart, and the other of the said groups being arranged exteriorly of the inner group and having its first, second and third outermost convolutions more widely spaced from each other than the spacing between adjacent convolutions of the said inner group of convolutions.

2. As a new article of manufacture, a spiral hairspring for time-instruments comprising two groups of spiral convolutions, one of the said groups being an inner group having the convolutions thereof substantially uniformly spaced apart, and the other of the said groups being arranged exteriorly of the inner group and having its first, second and third outermost convolutions more widely spaced from each other than the spacing between adjacent convolutions of the said inner group, and the spacing between the said first and second outermost convolutions being wider than the spacing between the said second and third outermost convolutions.

3. In a time-movement the combination of: a spiral hairspring and a rotatably-mounted regulator therefor, having spring-engaging means; the said spiral hairspring comprising two groups of spiral convolutions, one of the said groups being an inner group having the convolutions thereof substantially uniformly spaced apart, and the other of the said groups being arranged exteriorly of the said inner group and having its first, second and third outermost convolutions more widely spaced from each other than the spacing between adjacent convolutions of the said inner group of convolutions; and the said first outermost convolution having a portion thereof engageable by the said spring-engaging means arranged concentric to the path of rotation of the said regulator.

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