Feb. 5, 1952 L. R. BURGHOFF 2,584,786

METHOD FOR PROVIDING TIMEPIECES WITH SPIRAL-HELIX HAIRSPRINGS

Filed May 4, 1948

Fig. 1.

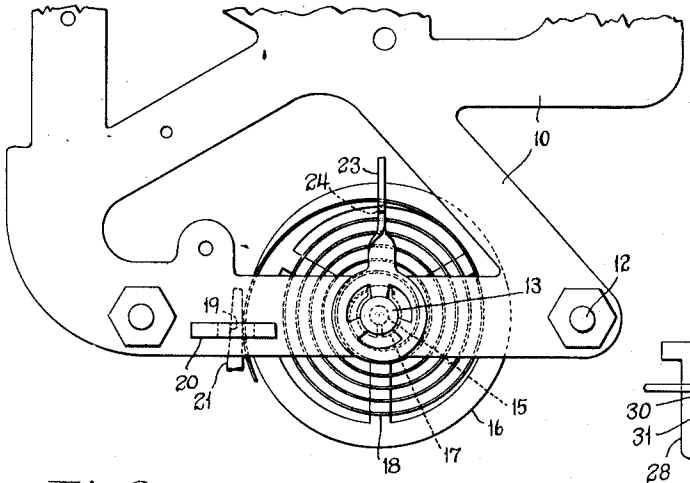


Fig. 5.

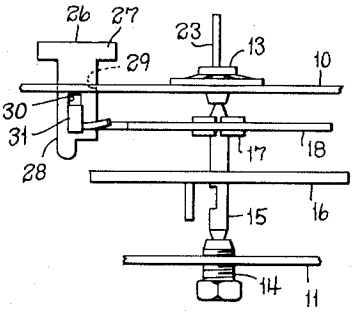


Fig. 2.

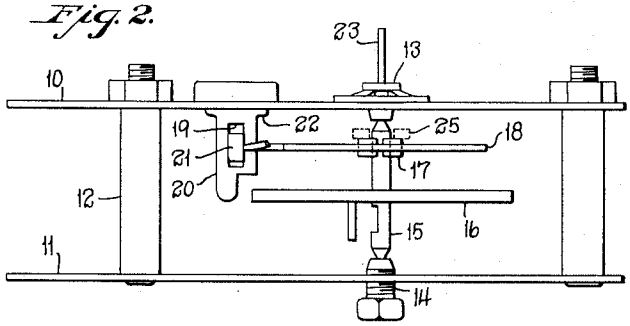


Fig. 6.

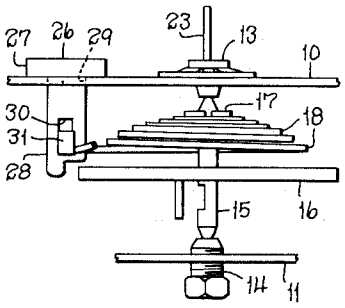
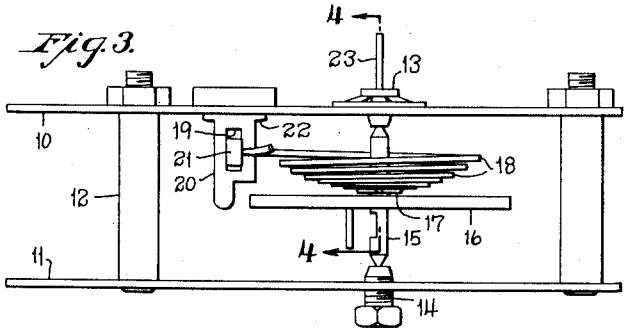


Fig. 3.



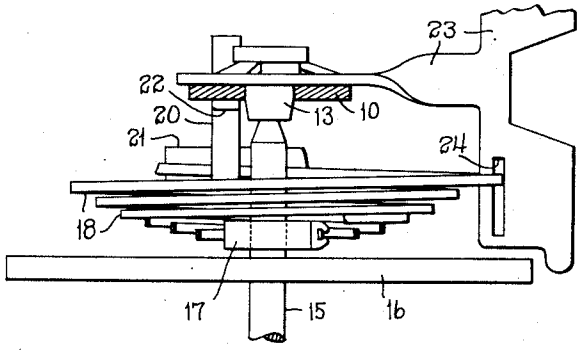


Fig. 4.

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METHOD FOR PROVIDING TIMEPIECES WITH SPIRAL-HELIX HAIRSPRINGS

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1 Claim. (Cl. 29—177)

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The present invention relates to improvements in the art of manufacturing escapement timepieces such, for instance, as spring-driven clocks and watches, and relates more particularly to methods for providing escapement timepieces with spiral-helix hairsprings.

Most escapement timepieces as heretofore produced have employed spiral hairsprings each of which has had its convolutions arranged in substantially a common plane. Other escapement timepieces have also been proposed in which a given hairspring has had certain portions displaced out of the usual common plane but such constructions have been expensive to produce and have not been otherwise fully satisfactory.

One of the main objects of the present invention is to provide a superior method whereby escapement timepieces may be provided with spiral-helix hairsprings at low cost.

Another object of the present invention is to provide a superior method whereby ordinary hairsprings having the usual substantially-flat spiral characteristics may be accurately and economically converted into spiral-helix hairsprings.

A further object is to provide a superior method whereby hairsprings which are slightly defective for ordinary use, may be utilized in clocks or the like and caused to perform satisfactorily and accurately.

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 face view of a clock movement showing a hairspring installed therein in ordinary spiral form, and prior to being converted into combined spiral-helix form in accordance with the present invention;

Fig. 2 is an edge view thereof;

Fig. 3 is a view similar to Fig. 2 but showing the displacement of the inner portion of the hairspring relative to its outer portion, to thereby convert the said hairspring into spiral-helix form;

Fig. 4 is a broken sectional view on an enlarged scale taken on the line 4—4 of Fig. 3 but with some of the outer convolutions of the hairspring left in elevation;

Fig. 5 is a broken view similar to Fig. 2 and showing another mode of carrying out the invention, with the hairspring shown prior to having its outer end displaced with respect to its inner end; and

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Fig. 6 is a view similar to Fig. 5 but showing the anchoring-stud forced inwardly to convert the hairspring into spiral-helix form.

The showing of Figs. 1 to 4 inclusive

In Figs. 1 to 4 inclusive is illustrated in a fragmental manner, a clock movement which comprises two complemental movement-plates 10 and 11 which are held in spaced relationship by means of a suitable number of pillars 12. The said parts may be regarded as a frame.

Extending inwardly through the movement-plate 10 is a bearing-stud 13 and similarly extending inwardly through the complemental movement-plate 11 is a bearing-stud 14, both of which are in axial alignment. Supported for oscillation at its respective opposite ends in the bearing-studs 13 and 14 is a balance-staff 15 upon which is rigidly mounted a usual balance wheel 16.

Mounted upon the balance-staff 15 above referred to at a point intermediate the balance wheel 16 and the movement-plate 10, is a collet 17 which is rigid on the said balance-staff for all normal operating strains which may be axially moved on the said balance-staff for purposes as will hereinafter appear. The said collet may be regarded as an inner fastening-member for reasons as will hereinafter appear.

Fastened in any suitable manner to the collet 17 is the inner end of a hairspring 18 which has its outer end passed through an aperture 19 formed in an anchoring-stud 20 which acts as an outer fastening-member. The outer end of the hairspring is fixedly mounted in the aperture 19 in any suitable manner such, for instance, as by means of a wedge-like retaining-pin 21 driven into said aperture.

The anchoring-stud 20 above referred to extends inwardly through the movement-plate 10 and is rigidly secured thereto in any suitable manner such, for instance, as by staking the said anchoring-stud as at 22.

Mounted for turning movement on the bearing-stud 13 and against the outer face of the movement-plate 10 is a regulating-lever 23 which is provided with an aperture 24 through which the outer portion of the hairspring 18 extends, in a manner common in the art.

It may here be explained that it is customary to "set" hairsprings such as 18 in a simple spiral

form prior to installation in a timepiece. In Figs. 1 and 2, the hairspring 18 is shown as so installed.

Following the assembly of the hairspring with the remaining parts described as above, a suitable tool schematically indicated by the broken lines 25 in Fig. 2, may be inserted between the inner face of the movement-plate 10 and the opposing face of the collet 17. After such insertion, the said tool may be forced toward the balance wheel 16, to thereby shift the collet 17 toward the balance wheel 16, into substantially the position in which it is indicated in Fig. 3. In the manner just described, the hairspring 18 or its equivalent is converted into a compound spiral-helix form, which form has many advantages.

The unit comprising the parts 15, 16, 17 and 18 may be tested for timing, either while in the conditions illustrated in Figs. 1 and 2, or when in the conditions illustrated in Figs. 3 and 4.

The showing of Figs. 5 and 6

The parts shown in Figs. 5 and 6 correspond to the parts shown in the preceding figures and bear like reference characters with the exception that the anchoring-stud 20 previously described is replaced by an anchoring-stud generally designated by the reference character 26. The said anchoring-stud is generally of T-shaped form and includes a head 27 and a stem or leg 28. The stem or leg 28 just referred to is adapted to tightly extend through a passage 29 in the movement-plate 10 with a force fit.

The leg 28 of the anchoring-stud 26 is provided with an aperture 30 adapted to receive the outer end of the hairspring 18 and in which the latter may be secured by means of a retaining-pin 31.

In its initial condition, as is indicated in Fig. 5, the anchoring-stud is only partly forced through the passage 29 in the movement-plate 10, and the outer end of the hairspring 18 is secured to the said anchoring-stud by the retaining-pin 31.

Following the assembly of the parts into the relationships in which they are shown in Fig. 5, the anchoring-stud may be forced further inwardly through the passage 29 in the movement-plate 10, to bring its head 27 into seated engagement with the outer face of the said movement-plate, in the manner indicated in Fig. 6. The described movement of the anchoring-stud will convert the nominally spiral form of the hairspring into the compound spiral-helix form shown in Fig. 6.

If desired the anchoring-stud 26 may be forced only slightly inwardly toward the position in which it is shown in Fig. 6, and the collet 17 may be shifted slightly in the opposite direction to thus impart the desired spiral-helix form to the hairspring.

Résumé

From the foregoing, it will be apparent that by first installing an ordinary spiral hairspring in a standard manner in a time-movement, the said ordinary hairspring may be converted into spiral-helix form and in simple and inexpensive manner, to thus obtain the advantages inherent in the said spiral-helix form.

The hairspring in the spiral-helix form serves to not only minimize the "clashing" of its convolutions in the event of over-banking, but also minimizes the effect of magnetism, should the hairspring become magnetized.

By means of the present invention, it is possible to make use of slightly defective hairsprings and hairspring-and-collet assemblies without any harmful effect upon the timekeeping properties of the clock or watch in which such hairsprings or assemblies may be installed.

Thus, should a hairspring have one or more of its convolutions slightly deflected out of a common plane with the remaining convolutions, or should it be imperfectly mounted upon a collet so as to tilt with respect thereto, the said defects lose their significance in most instances, when, in accordance with the present invention, the hairspring is converted from a simple spiral form into the compound spiral-helix form shown and described.

As distinguished from a preformed helical hairspring, due to the fact that the hairspring of the invention is axially resiliently expanded in its final helix-like disposition, the latter is prevented from setting up adversely effective constantly-reversing axial thrust in the balance staff, and instead sets up a slightly varying substantially uni-directional thrust in the staff, whereby wear of the bearing surfaces is kept at a minimum.

It will be noted by reference to the drawings, that the pitch in axial direction of the outer convolutions of the hairspring after the same has been forced into the combined spiral-helix form, is preferably in excess of the width of the hairspring itself.

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 claim are intended to be embraced therein.

I claim:

The method of providing an escapement timepiece with a spiral-helix hairspring, comprising the steps of securing the inner and outer ends of a flat spiral hairspring to anchor members on a balance-staff and on the frame, respectively, of the timepiece without substantially axially distorting the spring; and subsequently deliberately shifting at least one of said anchor members away from the other anchor member axially of said staff, into its permanent disposition, through such a distance that said spring is axially resiliently expanded into helical disposition to such an extent that said spring will exert a substantially uni-directional thrust only on said balance-staff when the timepiece is running.

LOUIS R. BURGHOFF.

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