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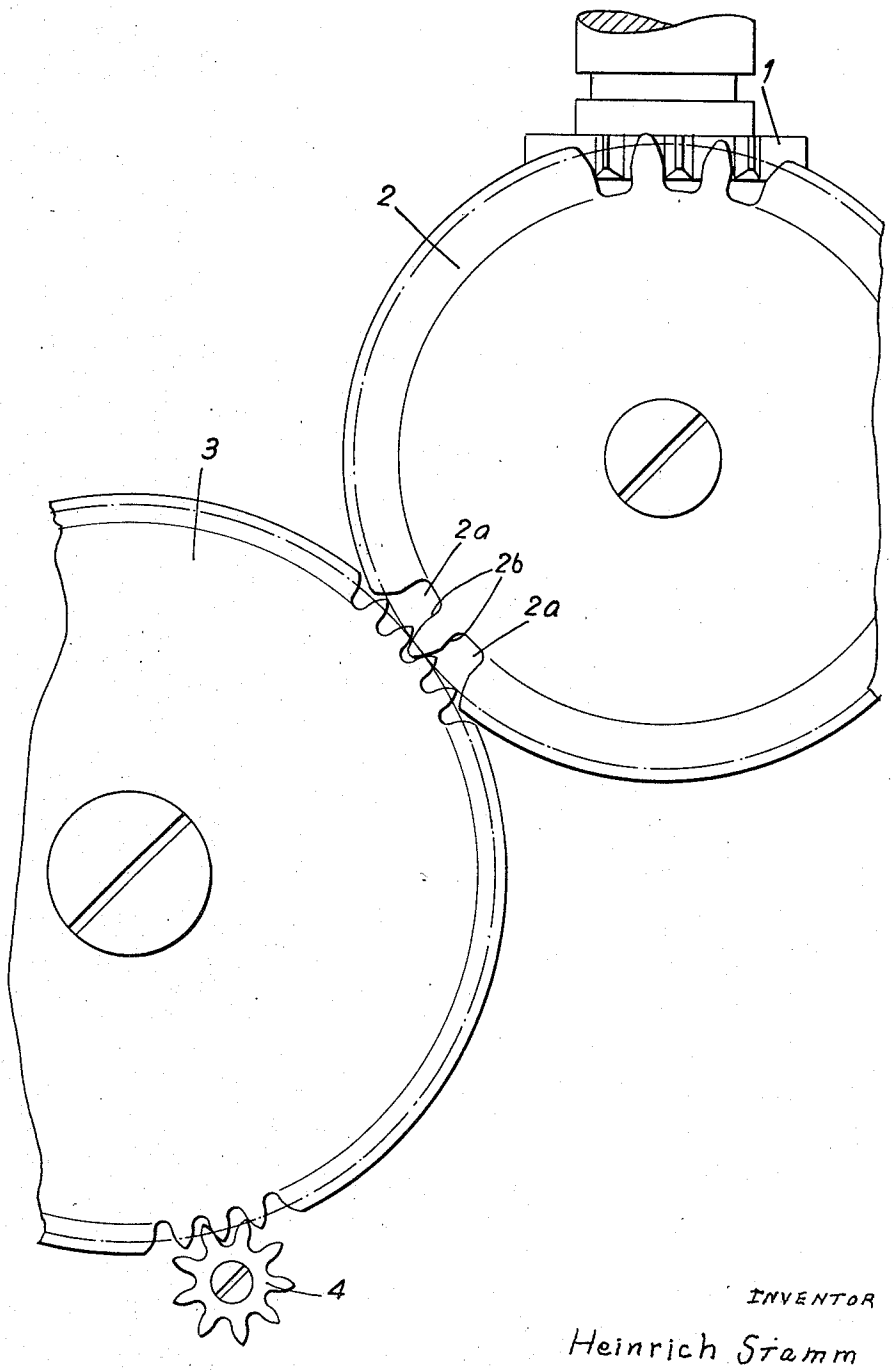

INVENTOR

Heinrich Stamm

By

Stevens, Davis, Miller & Mosher

ATTORNEYS

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WINDING DEVICE FOR WATCHES WITH BOTH A MANUAL WINDING AND A SELF-WINDING MECHANISM

Heinrich Stamm, Dahlenstrasse 55, Grenchen, Soleure, Switzerland

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This invention relates to winding devices for watches with both a manual winding and a self-winding mechanism and in particular to winding devices comprising a gear train composed of a manual winding pinion set on the winding stem, a crown wheel, a ratchet wheel and a driving pinion belonging to a self-winding gear train.

With most of the winding devices of this type, which are known in the art, the axis of rotation of the manual winding pinion is perpendicular to that of the crown wheel which is meshing with said manual winding pinion. As regards the ratchet wheel, which is secured on to the barrel arbor, it is meshing, on the one hand, with the crown wheel so as to enable its actuation by hand through said manual winding pinion and, on the other hand, with said driving pinion of the self-winding gear train, so as to be driven under the action of the self-winding mechanism.

The manufacture of a device of the type aforementioned has however to deal with a particular difficulty due to the meshing conditions to satisfy, on the one hand, between the manual winding pinion and the crown wheel and, on the other hand, between the self-winding pinion and the ratchet wheel. The toothings of the crown wheel and of the manual winding pinion meshing therewith should preferably have a relatively great circular pitch, since these two gears are perpendicular to one another. With a crown wheel having a relatively great circular pitch the ratchet wheel and consequently the pinion of the self-winding mechanism meshing therewith also have till now been given toothings with the same circular pitch. Since the self-winding pinion driving the ratchet wheel is most often made very small in order to provide for a step down ratio between said pinion and said ratchet wheel which is as great as possible, the driving pinion of the self-winding mechanism should, however, be provided with a toothing having a relatively small circular pitch, the ratchet wheel thereby obviously having the same small circular pitch.

To solve the problem of said meshing conditions two solutions have been proposed as yet, but none of them given satisfactory results. According to the first solution the different gears mentioned above are provided with toothings having a means circular pitch, i.e. a pitch comprised between that which would be advantageous between the ratchet wheel and the self-winding pinion driving the same, and that which would be convenient between the manual winding pinion and the crown wheel driven thereby. This solution has however, the drawback that none of the meshing conditions, either between the manual winding pinion and the crown wheel or between the self-winding pinion and the ratchet wheel is very satisfactory.

The second solution which has already been proposed in the art consists in mounting two ratchet wheels above and coaxially to one another, one of said ratchet wheels being provided with a toothing having a great circular pitch and meshing with the crown wheel and the other ratchet wheel having a small circular pitch and meshing with the self-winding pinion driving the same. With such an arrangement the above-mentioned difficulty is satisfactorily solved as far as the meshing conditions of

said gears are concerned, but this second solution obviously has the important drawback that the two superimposed ratchet wheels fatally involve a very undesirable increase of the watch movement total height.

It is therefore an object of this invention to provide a winding device of the type mentioned above in which satisfactory meshing conditions on the one hand, between the manual winding pinion and the crown wheel, and, on the other hand, between the ratchet wheel and the driving pinion of the self-winding mechanism meshing therewith are ensured while avoiding nevertheless any increase of the watch movement height.

A more specific object of this invention consists in providing the crown wheel with a toothing having a circular pitch equal to a multiple of that of the toothing of the ratchet wheel.

Still further objects of this invention will become apparent in the course of the following description.

One embodiment of the winding device improved in accordance with the invention is represented diagrammatically and by way of example in the annexed drawings.

In the drawings:

The single figure is a diagrammatic plan view of said embodiment.

The winding device represented in the drawings belongs to a watch provided both with a manual winding mechanism and with a self-winding mechanism. The manual winding mechanism comprises a pinion **1** located in the usual manner on a conventional winding and hand setting stem, the axis of which is perpendicular to that of the crown wheel **2** meshing with pinion **1**, as with usual watch movements. The toothing of crown wheel **2** meshes in turn with that of a ratchet wheel **3**, which is secured as usual on to the barrel arbor (not shown) of the watch movement. The ratchet wheel **3** itself meshes with a driving pinion **4** belonging to a gear train (not shown) forming part of said self-winding mechanism.

The toothing of crown wheel **2** has a circular pitch twice as great as that of the toothing of ratchet wheel **3**, so that only every second tooth of the ratchet wheel **3** is engaged by the teeth of the crown wheel. The crown wheel **2** and the ratchet wheel **3** have such diameters that this meshing arrangement is amply sufficient to ensure a satisfactory driving of the ratchet wheel **3** by means of the crown wheel **2** when the watch is wound manually through pinion **1**. These meshing conditions between the crown wheel and the ratchet wheel now enable providing very satisfactory meshing conditions between the crown wheel **2** and the manual winding pinion **1** since these two gears can be made with toothings having a relatively great circular pitch.

The toothing of crown wheel **2** can advantageously be obtained in the following manner: This crown wheel is first provided with a toothing corresponding exactly to that of the ratchet wheel, i.e. with a toothing having the same circular pitch as the ratchet wheel toothing. Every second tooth of the crown wheel is then cut, milled or punched out while providing notches **2*a*** in wheel **2**. As it may be observed in the drawings, the side edges **2*b*** of said notches are almost parallel to one another and each extend from the root of one of the adjoining remaining teeth of the crown wheel.

The circular pitch ratio between the crown wheel toothing and the ratchet wheel toothing can, of course, also be chosen different from 2:1, the circular pitch of the crown wheel being, however, obviously always an integer multiple of the circular pitch of the ratchet wheel. If said ratio has for some reason to be greater than 2:1, the crown wheel can also be made by firstly providing it with a toothing corresponding to that of the ratchet

wheel and by then cutting, milling or punching out an appropriate number of teeth to obtain the desired ratio between the circular pitches of said wheels.

The winding mechanism improved in accordance with this invention has still a further advantage. The meshing conditions between the manual winding pinion and the crown wheel are here even better than with the usual manual winding mechanisms in which said gears are provided with toothings having a relatively great circular pitch, because the conventional toothings, which are usually formed with involute teeth, are not very advantageous in the case of two wheels or pinions meshing at a right angle with one another. The teeth of said gears are, of course, engaging one another along their edges thus causing a great wear of the same. With the winding device improved in accordance with the invention the involute teeth of the manual winding pinion **1** mesh with the parallel edges of the remaining teeth of the crown wheel **2** thus ensuring much better meshing conditions between these two gears than with conventional devices.

While one embodiment of my invention has been described in detail with reference to the accompanying drawings, various changes in the shape, sizes, and arrangement of parts will appear obvious to those skilled in the art within the scope of the appended claims without departing from the spirit of the invention or sacrificing the advantages thereof.

I claim:

1. In a watch having a winding device including a manual winding mechanism and a self-winding mechanism, the winding device comprising a first winding toothed pinion operatively connected to the manual winding mechanism and having a predetermined great circular pitch and an axis of rotation, said first winding toothed pinion having involute teeth a toothed crown wheel meshing with said first winding pinion and having a circular pitch equal to said predetermined great circular pitch and an axis of rotation perpendicular to said axis of rotation of said first winding toothed pinion, a toothed ratchet wheel meshing with said crown wheel and having a predetermined small circular pitch an aliquot part of said predetermined great circular pitch and an axis of rotation in parallel relation to said axis of rotation of said toothed crown wheel, and a second winding toothed pinion operatively connected to the self-winding mechanism and having a circular pitch equal to said predetermined small circular pitch, said second winding pinion meshing with said ratchet wheel.

2. The winding device claimed in claim 1, notches being provided in said crown wheel between each pair of adjacent teeth thereof, said notches having parallel side edges cooperating with the teeth of said first winding pinion.

3. The winding device claimed in claim 2, said parallel side edges of said notches extending from the roots of said adjacent teeth.

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