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AUTOMATIC WINDING MECHANISM FOR WATCHES

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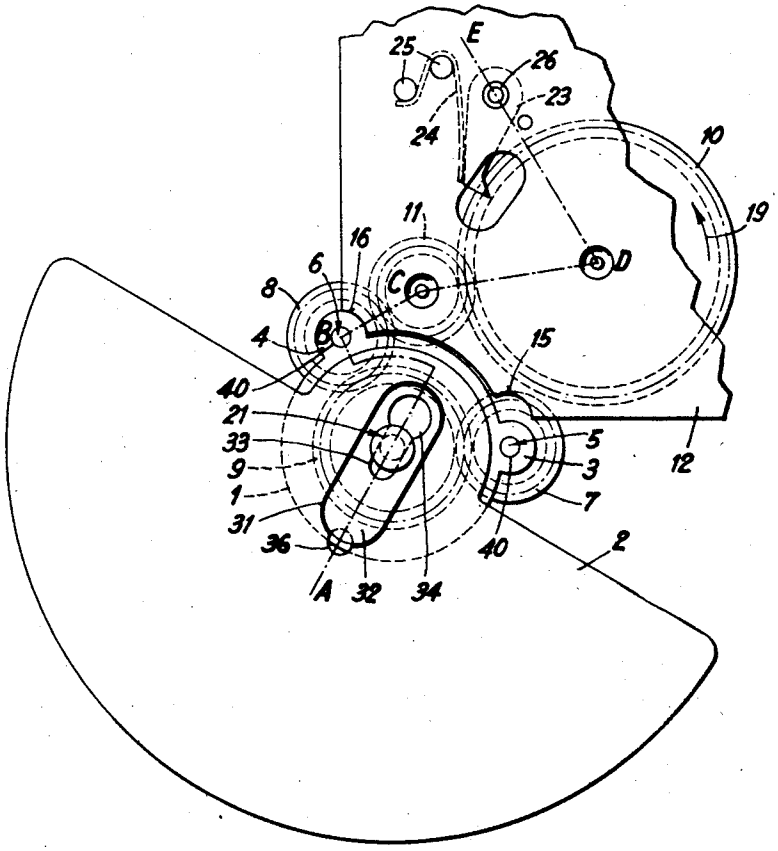


Fig. 1

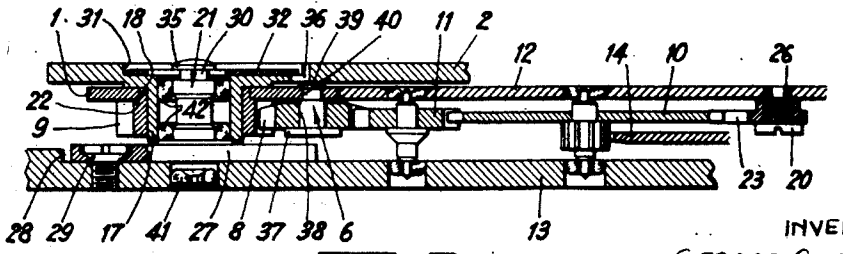


Fig. 2

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AUTOMATIC WINDING MECHANISM FOR WATCHES

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5 Claims. (Cl. 58—82)

This invention relates to automatic winding mechanisms for watches in which the winding operation is automatically assured by the displacements in both directions of a weight pivoting about a fixed axis.

The present invention is more particularly concerned with automatic winding mechanisms of a type in which the displacements in both directions of the movable weight are converted into unidirectional rotations of a gear wheel by means of a driving pinion fixed to the weight, two pinions pivoted on a rocker, and a counter-gear, this counter-gear and said gear wheel being in meshing relation with one another and being pivoted both in two bridges fixed to the frame of the watch movement.

This type of automatic winding mechanism is further characterised in that said driving pinion is coaxial to the weight and said rocker pivots coaxially to the weight, both pinions carried by the rocker being permanently in meshing relation with said driving pinion. Eventually the two pinions carried by the rocker alternately comes in meshing relation one with said counter-gear and the other with said gear wheel, according to the direction in which said weight is moving.

An automatic winding mechanism of this type has already been disclosed in the Swiss Patent No. 247,760.

In the mechanisms known prior to this invention the rocker is pivoted on a tubular projection of a fixed part, as for instance a bridge. When the direction of displacement of the weight changes, the rocker must pivot from one of its extreme positions to the other and this motion must be controlled by forces which may overcome the friction between the rocker and the tubular projection on which it is pivoting. In order to assure the development of such forces, the pinions carried by the rocker must be mounted on the pins around which they pivot with a sufficient friction, since this friction of the pinions and that of the rocker mentioned above are opposed.

These frictions, of course, reduce the efficiency of this type of automatic winding mechanism.

It is therefore an object of the invention to provide an automatic winding mechanism of the type described with an increased efficiency by pivoting the rocker on the movable weight itself so that the weight carries the rocker. The displacements of the rocker are thus made easier.

It is another object of the invention to axially secure the rocker on the weight by means of said driving pinion.

Still another object of the invention is to provide means for limiting the displacements of the rocker.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a plan view which shows the general arrangement of an automatic winding mechanism embodying the invention, and

Fig. 2 is a section through the same along the line ABCDE, whereby the portion AB is composed of two parts which are brought into line as shown by the arc of circle joining these parts in Fig. 1.

In the drawings, in which only those elements of the watch have been shown which are necessary for the comprehension of the invention, the numeral 1 designates a ring-like rocker which is pivoted coaxially to the movable weight 2. The rocker 1 is formed in one piece with two identical, substantially semicircular ears 3 and 4 projecting therefrom and extending in the plane of the rocker 1. This rocker is punched out of a metal strip so that the ears 3 and 4 have the same thickness as the rocker itself. Two pins 5 and 6 are fixed each in the center of one of these ears and two identical pinions 7 and 8 rotate each on one of said pins. Each of said pins is provided with a collar 37 for axially securing the pinion on the pin, a journal surface 38 on which the pinion rotates, and a portion 39 having a smaller diameter than the journal 38. The length of this portion 39 exceeds somewhat the thickness of the rocker 1. These portions 39 are engaged each in an opening of the same diameter provided in the center of each ear. These two pins are set in place on the rocker 1 with the pinions 7 and 8 and then the parts of the portions 39 which emerge from the other side of the rocker 1 are flattened down in the form shown by the numeral 40 in Fig. 2, so that both pins are definitely secured to the rocker 1 with their pinions. This rocker and the two pinions mounted thereon thus constitute only one building element which permits an easy handling by the worker who has to assemble or disassemble the watch. The length of the journal 38 exceeds somewhat the thickness of the pinions 7, 8 so that these pinions have an axial clearance between the rocker 1 and the collar 37 allowing the pinions to freely rotate.

The axes of these pinions move thus with the rocker 1 but they always remain at the same distance of the axis of rotation of the weight 2 so that the pinions 7 and 8 are permanently meshing each with a driving pinion 9 coaxially fixed to the weight 2.

The pinions 7 and 8 are arranged for coming into meshing relation each with a gear wheel 10 and a counter-gear 11, respectively. The gear wheel 10 and the counter-gear 11 mesh with one another and are pivoted both in the upper and the lower bridges 12 and 13 (Fig. 2) which constitute the frame of the automatic winding mechanism. The bridge 13 is the train-wheel bridge and the bridge 12 is itself fixed onto the train-wheel bridge 13 by any suitable means which are not represented.

The gear wheel 10 drives the barrel arbor by means of a train gear of which only a step down gear 14 is shown in Fig. 2.

The two extreme positions of the rocker 1, in which the movable units 7, 10 and 8, 11, respectively, are in suitable meshing relation, are limited by the bridge 12 of the automatic mechanism in which two crescent-like notches 15 and 16 are provided. The shape of these notches corresponds to that of the ears 3 and 4.

Fig. 2 shows in particular how the rocker 1 is pivoted on the weight 2 which has a tubular projection 17 on which the driving pinion 9 is pressed. A journal surface 18 and a shoulder 22 are provided on the pinion 9 for pivoting the rocker 1, which sits with very easy fit on this journal surface, and for holding said rocker axially in place, respectively. The driving pinion 9 is pressed onto the tubular projection 17 of the weight and its shoulder 22 axially holds the rocker 1 in place on the weight 2. Once the pinion 9 has been pressed onto the tubular projection 17 with the rocker 1, the weight 2,

the pinion 9, the rocker 1 and the pinions 7 and 8 constitute a single building unit which may be handled as a single element when assembling or disassembling the watch.

The pivoting axle of the movable weight 2 is constituted by a trunnion 21 formed in one piece with a trunnion plate 27 which is located in a shallow sink 28 provided in the train-wheel bridge 13. This sink 28 extends to those portions of the train-wheel bridge 13 where the lower bearings of the gears 10, 11 are provided and the walls of the sink 28 therefore only surrounds the plate 27 through an angle of about 270°. The trunnion plate 27 is maintained in the correct position within the sink 28 by means of three screws one of which is designated in Fig. 2 by the numeral 29. The position of the sink 28 and more particularly the locations of the screws 29 are so provided in the train wheel bridge 13 that the trunnion 21 is exactly located in the center of the watch movement. The trunnion 21 is thus coaxially disposed with the upper bearing 41 of a center wheel which may be either the second wheel of the train, leading from the barrel arbor to the escapement of the watch, or a center seconds wheel or fourth wheel of the same train. In the latter case the the upper bearing of the second wheel is provided in a not represented intermediate bridge, located, in Fig. 2, underneath the train-wheel bridge 13. This arrangement of the second wheel and either a center seconds wheel or the fourth wheel is well known in the art.

The pivoting axle of the movable weight could, however, be fixed to the bridge 13 in any other suitable manner.

A groove 30 is provided at the top of the trunnion 21 and an elongated sink 31 is provided in the upper surface of the weight. A metallic, thin and resilient plaquette 32 axially holds the weight 2 in place on the trunnion 21. The shape of the plaquette 32 corresponds to that of the sink 31. This plaquette is eventually provided with an elongated slot 33 enlarged at one end so as to form a circular aperture 34 having a diameter slightly larger than that of the head 35 of the trunnion 21. Two pierced jewels 42 pressed by force into the tubular projection 17 reduce the friction between the weight 2 and the trunnion 21.

In order to axially key the weight 2 on the trunnion 21, the plaquette 32 is so passed over the trunnion 21 that the head 35 of this trunnion is put in the aperture 34 so far that the walls of the slot 33 may be engaged in the groove 30. The plaquette 32 is then slid along its longitudinal axis until it reaches the position shown in the drawings in which this plaquette is entirely lodged within the sink 31. Since the plaquette 32 is resilient, it will remain by itself in the represented position, without providing further fixing means.

For removing the weight 2 from the trunnion 21 a sharp-pointed tool is introduced into a recess 36 provided in the weight 2 and the plaquette 32 is lifted out of the sink 31 so that it may be slid in the direction of its longitudinal axis until the circular aperture 34 may be passed over the head 35 of the trunnion 21, after which the weight 2 may be freely removed from the trunnion 21.

The movable weight could, however, be axially held in place on its pivoting axle by any other suitable means.

The rocker 1, which sits with easy fit on a journal surface solid with the movable weight (the journal surface 18 of the driving pinion 9), tends to be angularly driven by the weight. The frictions, between both the rocker 1 and the two pinions 7 and 8 and their pivoting axles, thus add their effects for angularly driving the rocker 1 with the weight 2.

A spring pressed pawl or detent 23 freely swings around a pipe 26 pressed into the bridge 12 of the automatic winding mechanism. The detent 23 is axially held in place on the pipe 26 by a screw 20. This detent is under the action of a spring 24 set around two bolts 25 also fixed to the lower surface of the bridge 12. The spring 24 is so set as to push the detent 23 against the gear wheel 10 into the toothing thereof. The detent 23 prevents the gear wheel 10 from rotating under the action of the mainspring in the direction opposite to that indicated by the arrow 19, the latter direction being that of winding.

Whatever the direction of the motion of the weight 2 may be, it will be shown by considering Fig. 1 that the gear wheel 10 is always driven in the direction of the arrow 19.

If the weight 2, indeed, rotates clockwise in Fig. 1, the weight carries the rocker 1 into the position represented in the drawings, whereby the ear 4 bears against the walls of the notch 16, the pinion 8 meshes with the counter-gear 11, and the pinion 7 rotates without useful action.

In this case, the driving pinion 9 also rotates clockwise with the weight 2, the pinion 8 is driven counterclockwise, the counter-gear 11 clockwise and the gear-wheel 10 is really driven in the indicated direction.

If the weight 2 begins now to move counterclockwise, the driving pinion 9 tends to drive the pinion 8 clockwise. The latter, in turn, tends to drive the counter-gear 11 counterclockwise and the gear wheel 10 clockwise. Since the gear wheel 10 is prevented from rotating in this direction by the detent 23, the teeth of the pinion 8 leave those of the counter-gear 11 and the rocker 1, fully carried by the weight 2, swings counterclockwise with the weight until the ear 3 bears against the walls of the notch 15 provided in the bridge 12. The pinion 7 comes then in meshing relation with the gear wheel 10 and the pinion 8 rotates without useful action.

In this case, the driving pinion 9 drives the pinion 7 clockwise and the gear wheel 10 counterclockwise as indicated by the arrow 19.

If the weight 2 then stops rotating counterclockwise and begins to rotate again clockwise, the pinion 7 tends to drive the gear wheel 10 clockwise. Since this gear wheel is prevented from rotating in this direction by the detent 23, the pinion 7 leaves the gear wheel 10 and the rocker 1, carried by the weight 2, returns into its original position represented in the drawings.

It is quite clear that the weight 2 can either be angularly entirely free to rotate through 360° or the displacements of the weight 2 be angularly limited by stops, without changing anything in the function of the winding mechanism described hereabove.

In the previously described winding mechanism, the rocker 1 can impossibly remain in an intermediate position, whereby none of the pinions 7 and 8 would be in meshing relation either with the gear wheel 10 or with the counter-gear 11, as it could occur with the mechanisms known in the art. The rocker 1, which is carried by the movable weight 2, rotates, of course, with the latter until one of its pinions comes into meshing relation with either one of the gears 10, 11.

I wish it to be understood that the form of the invention herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention, or the scope of the subjoined claims.

I claim:

1. In an automatic winding mechanism of the type described, the combination of an oscillatory member movable about a fixed axis and having a coaxial tubular projection, a driving gear pressed onto said tubular projection, a rocker pivotally arranged about the tubular projection of said oscillatory member and axially held in place by a portion of said member and said driving gear, two pinions rotatably arranged on said rocker and being each in meshing relation with said driving gear, and pivot means extended into said tubular projection to

support said oscillatory member for turning movement about said axis, said oscillatory member being removably connected to said pivot means so that said oscillatory member is removable from said pivot means together with said driving gear, said rocker, and said pinions whereby said oscillatory member, driving gear, rocker and pinions form a subassembly which may be removed from and connected to the mechanism as a unit.

2. In a watch an automatic winding mechanism of the type described, comprising in combination a frame for the winding mechanism, an oscillatory member carried by said frame for free turning movement about a fixed axis, a driving gear coaxially fixed to said member for turning movement therewith, a rocker carried by said member and being so arranged as to pivot on said member coaxially thereto, two ears projecting from said rocker and extending in the plane thereof, two pins fixed each in one of said ears, two pinions pivoted each on one of said pins and being each in meshing relation with said driving gear, two notches being provided in a portion of said frame located in said plane, the form of said notches corresponding to that of said ears, each of said notches cooperating with one of said ears for limiting the angular displacements of said rocker in one direction and a pair of additional gears meshing with each other and supported at least in part for turning movement by said portion of said frame, one of said additional gears meshing with one of said pinions when one of said ears cooperates with one of said notches and the other of said additional gears meshing with the other of said pinions when the other of said ears cooperates with the other of said notches.

3. In a watch an automatic winding mechanism comprising in combination a trunnion, a fixed frame carrying said trunnion, an oscillatory member pivotally arranged on said trunnion and having a coaxial tubular

projection, a driving gear pressed onto said tubular projection, a ring-like rocker pivotally arranged about said tubular projection and being axially maintained in place by said driving gear, two semicircular ears projecting from said rocker and substantially extending each in the plane thereof, two pins fixed each in one of said ears, two pinions pivoted each on one of said pins and being each in meshing relation with said driving gear, two additional gears meshing with one another and being pivoted in said frame, said gears being so disposed as to be alternately driven each by one of the pinions carried by said rocker, two notches being provided in a portion of said frame located in said plane, the form of said notches corresponding to that of said ears, each of said notches cooperating with one of said ears for limiting the angular displacements of said rocker in one direction and means releasably holding said oscillatory member on said trunnion so that said oscillatory member together with said driving gear, rocker, and pinions may be removed from and replaced on said trunnion as a unit.

4. The combination of claim 3, whereby the driving gear has a shoulder and a coaxial journal surface and the rocker pivots on said journal surface and is axially held in place by said shoulder.

5. In a watch as defined in claim 2, said portion of said frame being a bridge of the watch movement.

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