Oct. 15, 1963 H. KOCHER 3,106,818

SELF-WINDING WATCH MOVEMENT

Filed June 21, 1955 2 Sheets-Sheet 1

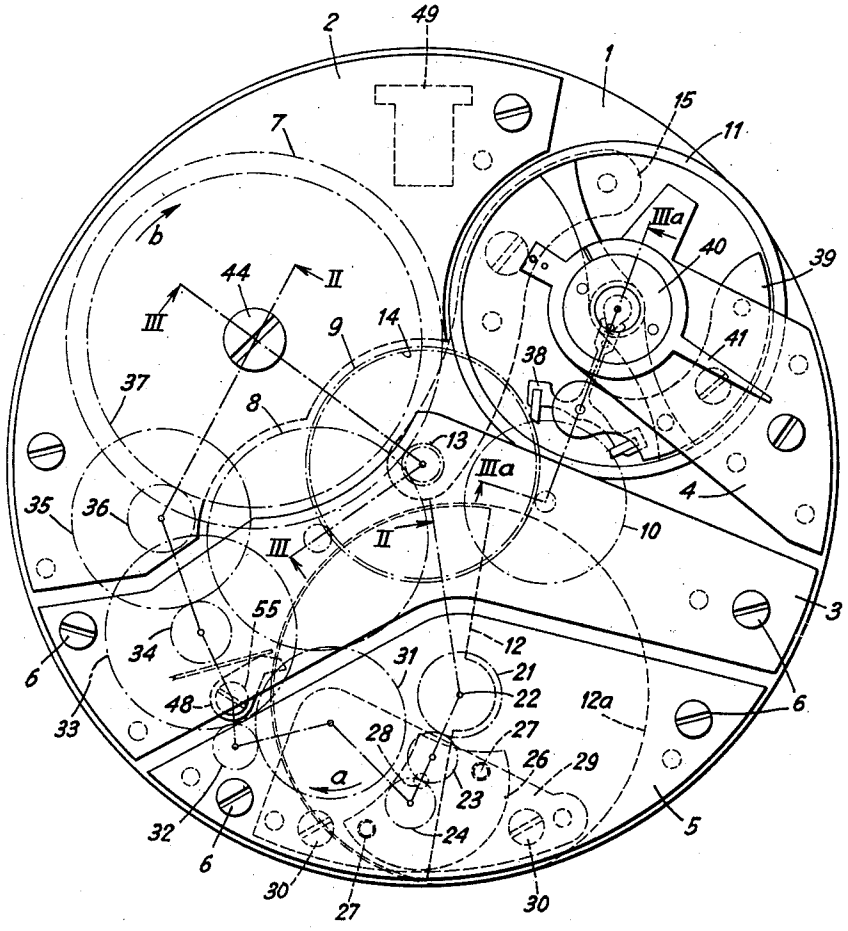

Fig. 1

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Filed June 21, 1955 2 Sheets-Sheet 2

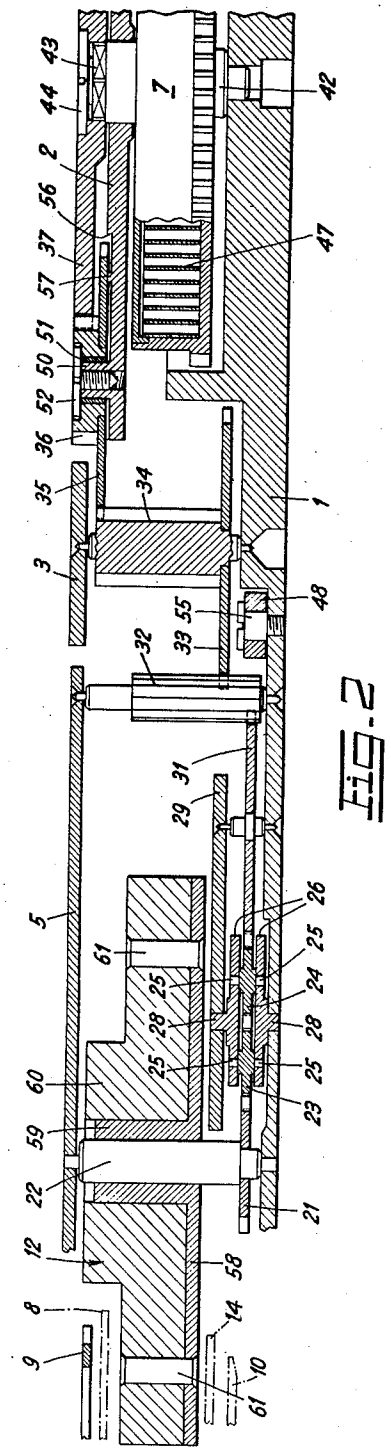

Fig. 2

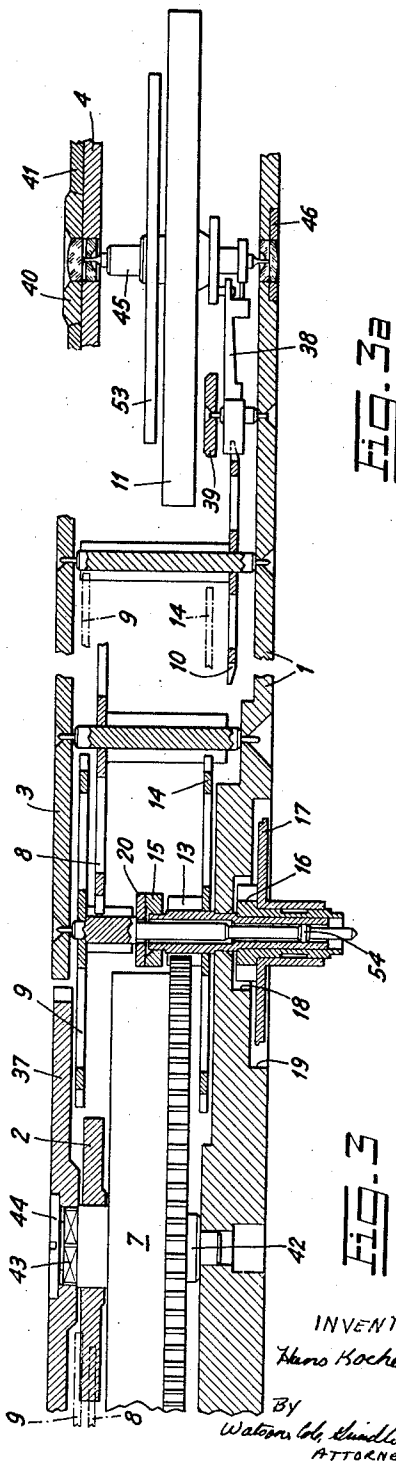

Fig. 3a

Fig. 3

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SELF-WINDING WATCH MOVEMENT

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This invention relates to self-winding watch movements and in particular to movements comprising as usual a barrel containing a mainspring which drives a motion work under control of an escapement mechanism to which the barrel in connected by a train of gear wheels, the barrel, the escapement mechanism and the gear wheels of this train being located within a frame including a base plate and bridges fixed thereto, said movements being wound up by means of a rotatable weight operatively connected to the barrel arbor.

In the movements known in the art this winding weight is located above the bridges of the barrel and of the gear wheels connecting the barrel to the escapement mechanism. Moreover the heavy material of these known weights is concentrated in a ring sector.

These known constructions have thus the drawbacks that the provision of a self-winding mechanism substantially increases both the height and the diameter of a common watch movement without self-winding mechanism.

It is therefore an object of this invention to locate the winding weight within the watch movement frame thus avoiding any increase of the height of the watch movement when providing it with a self-winding mechanism.

Another object of the invention consists in using a weight in which the heavy material is concentratel in a cylindrical sector thus allowing the use of a weight, which can accomplish full revolutions, in a movement which is not very much larger than a common movement without self-winding mechanism.

Still further objects of the invention will appear in the course of the following description.

One embodiment of the invention is represented diagrammatically and by way of example in the drawings annexed to this specification and forming part thereof.

In the drawings:

FIG. 1 is a plan view of the watch movement from the side of the bridges,

FIG. 2 is a cross-section along the broken line II—II of FIG. 1,

FIG. 3 is a cross-section along line III—III of FIG. 1, and

FIG. 3*a* is a cross-section along line III*a*—III*a* of FIG. 1.

In the watch represented the train of gear-wheels and most of the movable elements of the watch are located within a frame constituted by a baseplate **1** and four upper bridges **2**, **3**, **4**, **5** located substantially at the same level and fixed to the baseplate **1** in the usual manner by means of screws **6** as shown in FIG. 1. The bridge **2** carries the upper bearing of the barrel **7**, whereas the bridge **3** helps journalling the third wheel **8**, the fourth wheel **9** and the escape wheel **10**. The upper bearing of the balance wheel **11** is carried as usual by the cock **4**, whereas the independent bridge **5** carries the upper bearing of the winding weight **12** (FIG. 2). The travelling path of the outmost points of this weight or in other words the space which must be free for the weight **12** is represented in FIG. 1 by the dotted circle **12***a*. This figure shows that the barrel **7**, the balance wheel **11** and the weight **12** have approximately the same diameter and that they are located within the frame of the watch movement beside one another. Since the weight

12 is journalled in the center of the circle **12***a*, it can accomplish complete revolutions.

FIGS. 1 and 3 show that the barrel **7** meshes with a pinion **13** fixed to the second wheel **14**. The latter is journalled in the baseplate **1** and in an intermediate bridge **15** fixed to the baseplate **1**. The axle of this wheel **14** is hollow and it carries as usual a cannon-pinion **16** and an hour wheel **17** located within countersinks **18** and **19**, respectively, of the baseplate **1**, which are provided on the dial side thereof. The sleeves of these two latter elements, which pass through an opening of the dial (not shown) in order to carry the hands, are the only elements of the watch movement, which are extending beyond the plane of the lowest face of the baseplate **1**.

The axle of the fourth wheel **9** extends throughout the hollow axle of the center wheel **14**. This fourth wheel axle is made with a bearing surface **54** by means of which it is journalled within the hollow shaft of the wheel **14**. The wheel **9** is thus journalled coaxially to the wheel **14** and it carries a sweep second. Its axial play can be adjusted independently from that of the center wheel **14** by means of a small plate **20** fixed to the bridge **15**.

As shown in FIGS. 1 and 2 the weight **12** passes above the center wheel **14** and the escape wheel **10** and below the third wheel **8** and the fourth wheel **9**. FIG. 1 shows further that the third wheel **8** is located between the barrel **7** and the weight **12**, whereas the escape wheel **10** is located between the weight **12** and the balance wheel **11**.

The displacements of the weight **12** are transmitted to the barrel arbor **12** by means of a reversible input unidirectional output mechanism represented in FIGS. 1 and 2. This mechanism is controlled by a driving wheel **21** coaxially fixed on to the axle **22** of the weight **12**. It comprises two pinions **23** and **24** meshing with one another. Each of these pinions is integral with an axle the pivots **25** of which freely turn within bearings carried by two plates **26** fixed to one another at a well determined distance by means of pillars **27**. The two plates **26** constitute a rocker and they are provided each with a pivot **28** at their outer faces. The lower pivot **28** (FIG. 2) is journalled in a bearing carried by the baseplate **1**, whereas the upper pivot **28** can turn freely within a bearing carried by an intermediate bridge **29**. The latter is located under the weight **12** as shown in FIG. 1 and it is fixed to the baseplate **1** by means of two screws **30**.

The pinions **23** and **24** are adapted to come alternately in meshing relation with a winding wheel **31** journalled in bearings carried by the baseplate **1** and by bridge **29**. This wheel **31** can freely rotate in the direction of arrow *a*. A spring pressed pawl **48**, pivotally mounted on a screw bolt **55** screwed in the baseplate **1**, prevents wheel **31** from rotating in the reverse direction. The pinion **23** always meshes with the driving wheel **21** which puts it in meshing relation with the wheel **31**, if the weight **12** starts rotating clockwise in FIG. 1, the rocker thereby pivoting counterclockwise. Should on the contrary the weight **12** start rotating counterclockwise, the wheel **31**, which is stopped by the pawl **48**, would then thrust the pinion **23** out of meshing relation therewith and the wheel **21** would drive the rocker clockwise until the pinion **24** meshes with the wheel **31**.

Thanks the rocker described the two pinions **23** and **24** convert the rotations in both directions of the weight **12** into unidirectional rotations of the winding wheel **31**.

As shown in FIGS. 1 and 2, the wheel **31** is connected to the barrel arbor **42** by means of a gear train. This gear train, its location in the watch movement frame, as well as the particular arrangement of the watch movement frame parts for accommodating said gear train therewithin do however not constitute a part of this in-

vention. As shown in the accompanying drawings the gear train provided between the winding wheel 31 and the barrel arbor 42 comprises a pinion 32, a first step down gear (33, 34) and a second step down gear (35, 36). The pinion 32 is journalled in bearings carried by the baseplate 1 and the bridge 5 and it meshes with wheel 31. The first step down gear comprises a wheel 33 meshing with pinion 32, and a pinion 34. It is journalled in a manner similar as pinion 32 in bearings carried by the baseplate 1 and by bridge 3. The wheel 33 is located on the level of bridge 29 so that it passes over pawl 48 and the holding bolt 55 thereof. The second step down gear also comprises a wheel 35 and pinion 36. This gear is mounted for free rotation on the barrel bridge 2 in a quite conventional manner, i.e., like the usual crown wheels, the pawls cooperating with the ratchet wheels and every intermediate gears occasionally provided on the barrel bridge. For this purpose a circular recess or countersink 56 is provided in the upper face of the barrel bridge 2 and a cylindrical tapped projection 50 is extending upward from the center of recess 56. To reduce the wear, a steel ring 51 is set, according to the usual practice, around projection 50 to serve as journalling surface for the gear (35, 36). An annular projection 57 is provided like in every similar case, as well known by those skilled in the art, to reduce the friction of gear (35, 36) on the bottom of recess 56. This gear (35, 36) is axially held in place on ring 51 by means of a conventional holding screw 52 screwed into the tapped portion of projection 50, the screwing direction of screw 52 preferably corresponding, as it is usual in similar cases, to the direction in which gear (35, 36) is rotating during the operation of the self-winding mechanism.

The gear train 32–36 drives a usual ratchet wheel 37 conventionally set on a square portion 43 of the barrel arbor 42 and axially held thereon by a usual fixing screw 44. Under the action of gear train 32–36 the ratchet wheel 37 rotates in the direction of arrow *b* thus storing up energy in the watch main spring 47 located in barrel 7. The latter drives the motion work comprising the cannon-pinion 16 and the hour wheel 17 by means of the center wheel pinion and shaft. This motion occurs under control of the escapement mechanism to which the great wheel 14 is connected by wheels 8, 9 and 10. The escapement mechanism, which does not constiute a part of this invention, comprises a conventional lever 38 rockably mounted in the base plate 1 and a lever bridge 39 extending below the balance wheel 11 and fixed to the baseplate. Lever 38 cooperates in the usual manner with the escape wheel 10 and with the rollers 7 on the balance staff 45 to keep the balance wheel 11 oscillating under the action of its hair spring 53. The balance staff 45 is journalled as usual in bearings carried by the baseplate 1 and the cock 4. An upper end piece 40, conventionally fixed to the cock 4, and a lower end piece 46, conventionally fixed to the baseplate 1, limit the axial play of this staff 45. A well known regulator pointer 41 conventionally pivoted around the upper end piece 40 enables regulating the frequency of the balance wheel oscillations in the manner well known in the art.

The weight 12 has at least approximately the form of a circular cylindrical sector. It comprises a plate 58 made integral with a sleeve 59 set with force fit on to the arbor 22. A piece 60 of homogeneous heavy material, for instance a tungsten alloy, is fixed to the plate 58 by means of rivets 61.

Experiments have shown that this new kind of weight 12 ensures winding up the watch at least as well as a weight in which the heavy material is concentrated in an annular sector moving around the watch movement frame.

An advantage of the construction described consists in the fact that the movement of this self-winding watch is not thicker than any ordinary watch movement which

is not provided with a self-winding mechanism at all. Moreover, the construction described contains a reversible input unidirectional output mechanism for converting the displacements in both directions of the weight into unidirectional movements of the barrel arbor, which is well known in the art but the new arrangement of the weight according to the invention enables a particularly advantageous construction of this mechanism.

In the constructions known the rocker could not be made of two plates, because it would be too thick. These rockers known usually consist of a single plate carrying two trunnions on one side and a pivot on the other side, said trunnions serving as axles for the pinions carried by the rocker and the said pivot serving for journalling the rocker itself. The diameters of said trunnions and of said pivots were thus accordingly much more larger than that of the pivots 25 and 28. In other words, a construction according to the present invention enables a substantial reduction of the friction of the movable elements of the said mechanism as compared to prior art constructions.

The arrangement described easily enables providing a selfwinding watch with a sweep second, whereas such a provision substantially increases the height of the watches in which the winding weight is pivoted in the center of the watch movement above the bridges. It will be understood, however, that the fourth wheel needs not to be located in the center of the watch movement. This fourth wheel could also be located elsewhere for instance so that a small second hand could be fixed on its axle.

While one embodiment of the invention has been shown and described, various changes in the shape, size and arrangement of parts could obviously be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A self-winding watch movement comprising in combination: a frame including a baseplate and bridges fixed thereto on one side thereof; movable elements including a barrel adapted to contain a mainspring, an escapement mechanism and a train of gear wheels connecting said barrel to said escapement mechanism, said movable elements being journalled in and located between said baseplate and said bridges, a weight rotatably mounted within said frame for accomplishing complete revolutions and located substantially on the same level as said movable elements, and motion transmitting means between said weight and said barrel to wind up a mainspring in said barrel when said weight is rotating.

2. A self-winding watch movement comprising in combination: a frame including a baseplate and bridges fixed thereto on one side thereof; movable elements including a barrel, an escapement mechanism and a train of gear wheels connecting said barrel to said escapement mechanism, said movable elements being journalled in and located between said baseplate and said bridges, and a winding weight in the form of a circular cylindrical sector rotatably mounted in said frame and located substantially on the same level as said movable elements.

3. The combination of claim 1, in which said weight is located between and journalled in said baseplate and an independent bridge located at the same level as the other bridges of said frame.

4. A self-winding watch movement comprising in combination: a frame including a base plate and bridges fixed thereto on one side thereof; movable elements including a barrel adapted to contain a mainspring, an escapement mechanism comprising a balance-wheel having a diameter approximately equal to that of said barrel and a train of gear wheels connecting said barrel to said escapement mechanism, said movable elements being journalled in and located between said baseplate and said bridges, a weight rotatably mounted for accomplishing complete revolutions and having approximately the same

diameter as said barrel and said balance-wheel and being pivoted within said frame substantially at the same level as said movable elements, at the side of said barrel and said balance-wheel, and motion transmitting means between said weight and said barrel to wind up a mainspring in said barrel when said weight is rotating.

5. The combination of claim 4, in which said train of gear wheels comprises a center and a fourth wheel pivoted coaxially in the center of said frame.

6. A self-winding watch movement comprising in combination: a frame including a baseplate and bridges fixed thereto on one side thereof; movable elements including a barrel adapted to contain a mainspring, an escapement mechanism and a train of gear wheels connecting said barrel to said escapement mechanism, said movable elements being journalled in and located between said baseplate and said bridges, a rotatable weight; gear means comprising a winding wheel between said rotatable weight and said barrel to insure winding of a mainspring in said barrel upon rotary motions of said weight; and a reversible input unidirectional output mechanism actuating said winding wheel and actuated by said weight, said weight being pivoted within said frame and being located substantially at the same level as said movable elements, said winding wheel and said reversible input unidirectional output mechanism being located at a level between the levels of said baseplate and said weight, respectively.

7. The combination of claim 6, in which a driving wheel is coaxially fixed to said weight, and said reversible input unidirectional output mechanism including two axles, two pinions meshing with one another, each being fixed to one of said axles, one of said pinions permanently meshing with said driving wheel, and a rocker formed by two plates fixed together so as to extend in parallel with one another and carrying each two bearings journalling said axles of said pinions, each plate carrying a pivot on its outer face journalling said rocker within said frame so that said rocker may oscillate from one extreme position into another extreme position, according to the direction of the movement of said driving wheel, for bringing either one of said pinions in meshing relation with said winding wheel.

8. The combination of claim 7, in which an independent bridge is fixed to said baseplate between the latter and said weight, said rocker being journalled in and located between the baseplate and said independent bridge.

9. In a self-winding substantially round watch, the combination of a barrel including a mainspring, a balance wheel, a movement operatively connecting the balance wheel with the barrel, a rocking weight freely revoluble round an axis eccentric with reference to that of the watch and adapted to turn in an unlimited manner round said axis in both directions, a wind up gearing extending in superposed relationship with reference to the rocking weight, controlled by the latter and adapted to drive the barrel and wind the spring in the latter upon rotation of the weight in either direction and a plate arrangement carrying the system constituted by said barrel, movement and balance wheel and the further system constituted by said superposed rocking weight and wind-up gearing, said systems lying in side-by-side relationship and having substantially the same total height.

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