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[54] **SELF-WINDING MECHANISM FOR WATCHES**

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[51] **Int. Cl.** **G04b 5/02**

[58] **Field of Search** ..... 58/82 R, 82 A; 235/105

[56] **References Cited**

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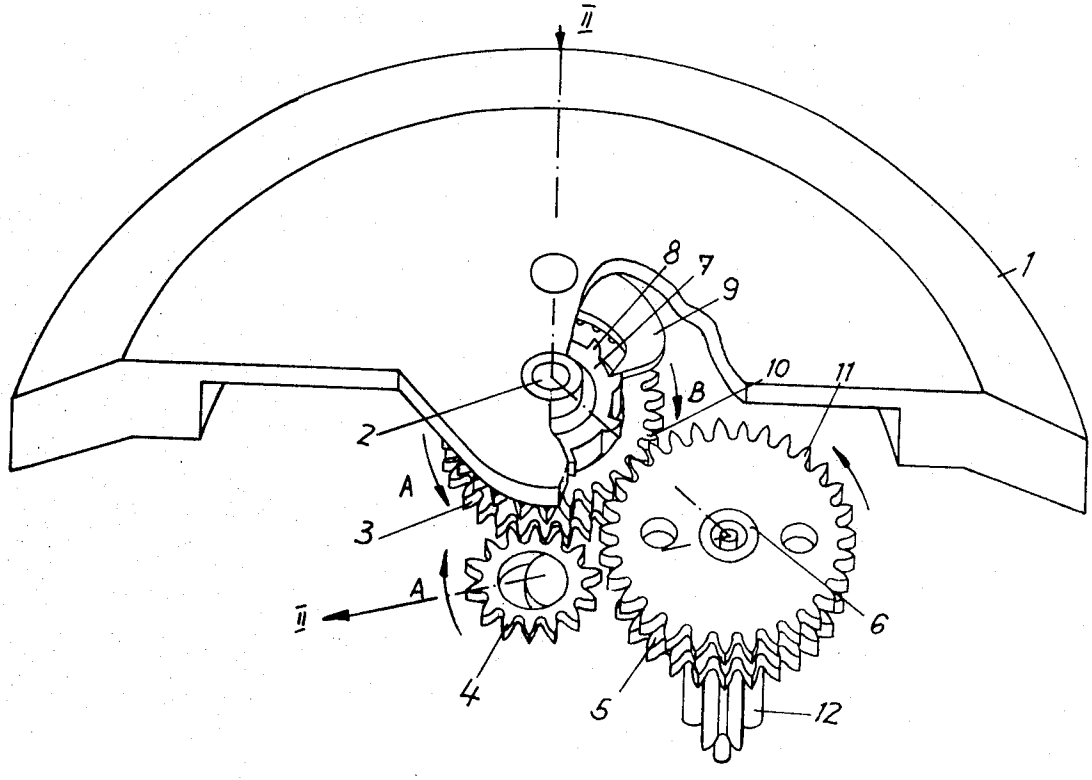
[57] **ABSTRACT**

A rotor is mounted on mounting means for rotation in first and second senses. A drive pinion is coaxial to and non-rotatably connected to said rotor. A ratchet wheel is freely rotatably mounted on said rotor. A stepping pawl is mounted on said rotor and arranged to interengage with said ratchet wheel so as to couple to said rotor for rotation in, and only in, said second sense. Idler gear means are rotatably mounted on said mounting means. A reversing gear is radially floatingly mounted on said mounting means and in mesh with said drive pinion and arranged to mesh with said idler gear means to rotate the same in said first sense only during a rotation of said drive pinion in said first sense. Means are provided to transmit motion from said ratchet wheel to said idler gear means to rotate the same in said first sense during a rotation of said rotor in said second sense.

11 Claims, 5 Drawing Figures



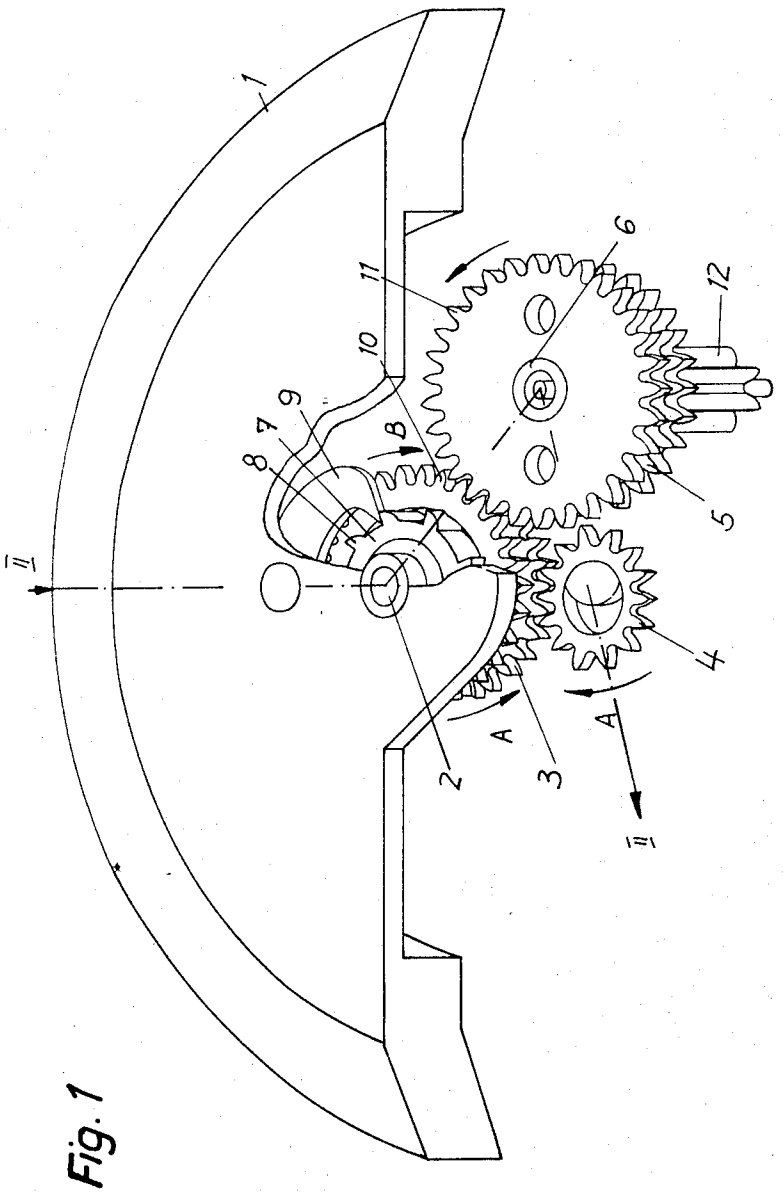


Fig. 1

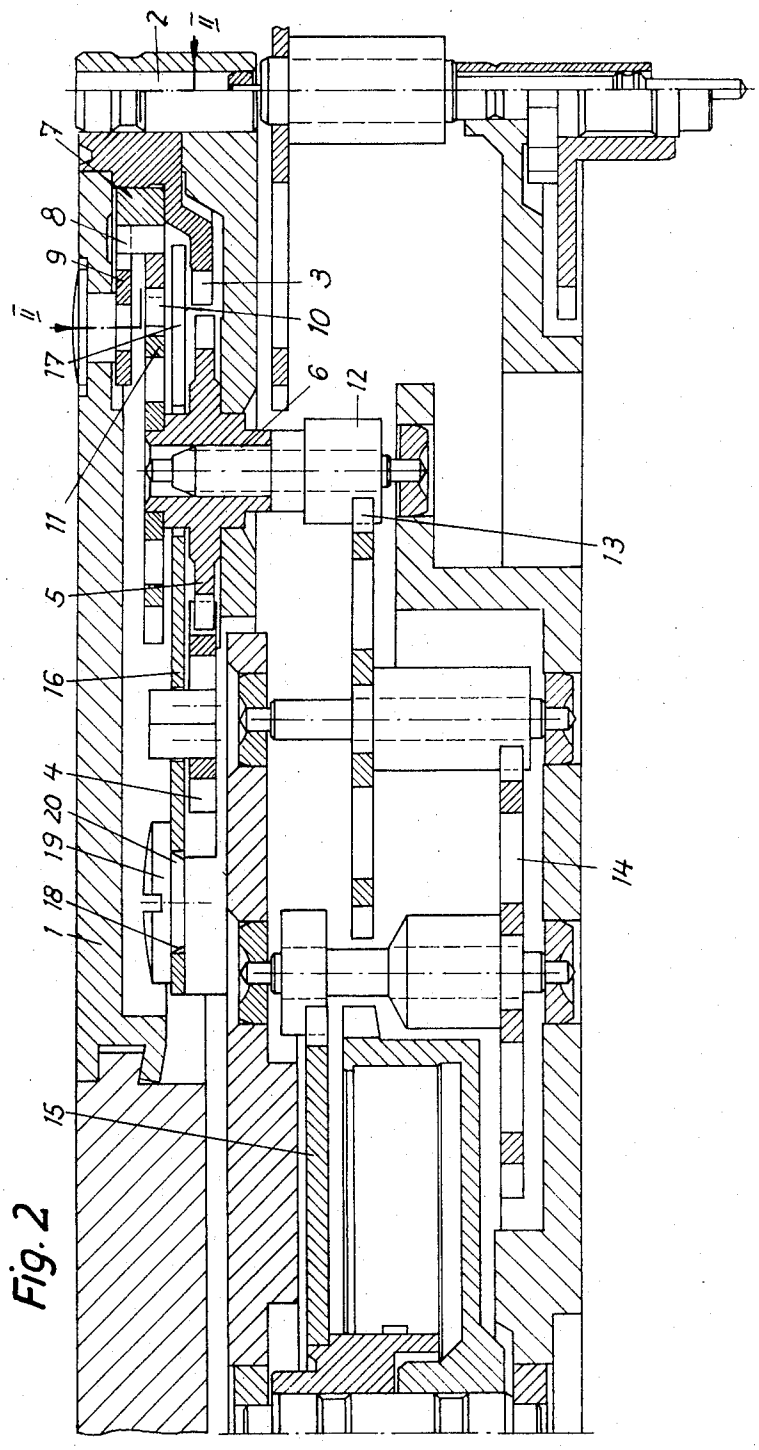


Fig. 2

Fig. 5

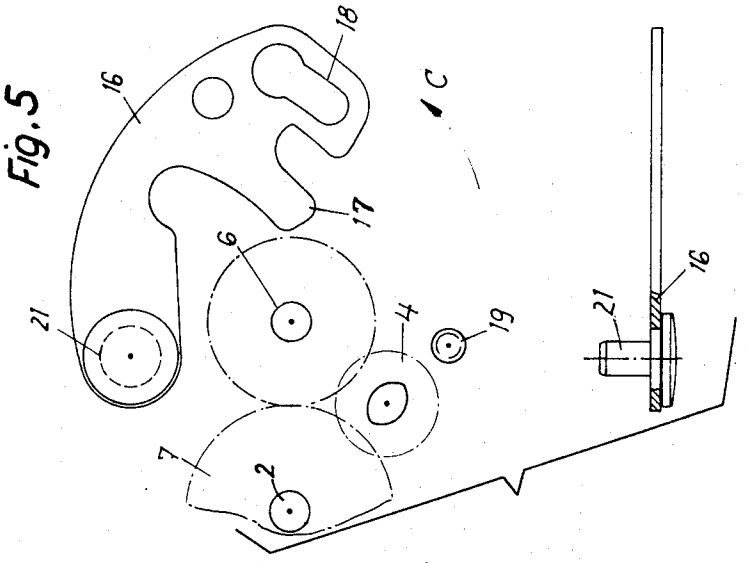


Fig. 4

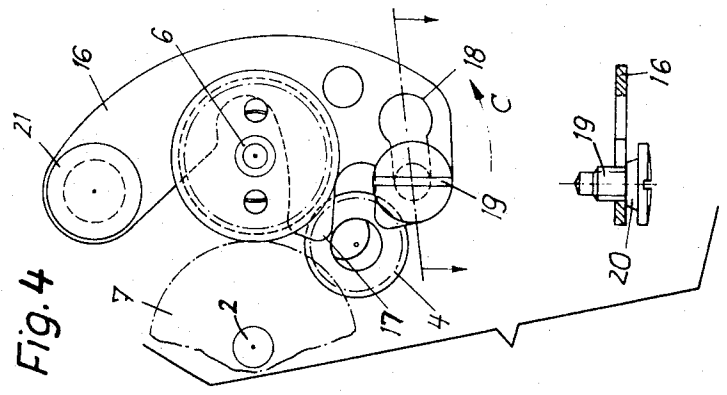
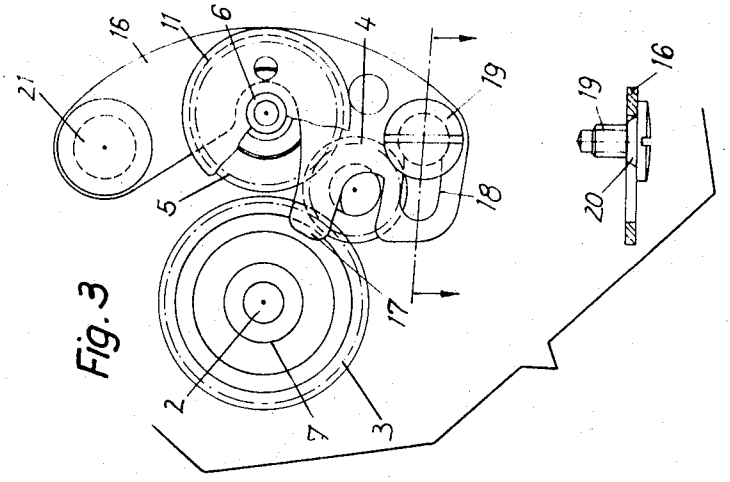


Fig. 3



SELF-WINDING MECHANISM FOR WATCHES

This invention relates to a self-winding mechanism, particularly for movements of ladies' watches, which mechanism comprises a rotor and a transmitting part.

Owing to the confined space, it is difficult to incorporate self-winding mechanisms in ladies' watches, particularly if a double-acting winding mechanism is desired and it is attempted to combine such mechanism with an existing caliber. In this case, the mechanism must not be excessively large also in height because with a given movement small in diameter, an excessively overall height would result in a watch which has a towerlike appearance, which is not desirable.

The present invention enables a design which even with a double-acting winding mechanism solves the problems which have previously arisen mainly in conjunction with the accommodation. To accomplish that object, the self-winding mechanism according to the invention, particularly for movements of ladies' wrist watches, is double-acting and comprises reversing means having elements carried by the rotor and is characterized in that the rotor carries a drive pinion, which in one sense of rotation of the rotor cooperates with a floating reversing gear, and the rotor also carries a ratchet wheel, which cooperates with a stepping pawl and during a rotation of the rotor in the opposite sense is coupled by the stepping pawl to the rotor and transmits by means of idler gear means the motion in the other sense of rotation of the rotor, whereas the reversing gear is then inoperative. This design is simpler than the known designs and more compact, requiring a smaller space.

The rotor is pressed on the drive pinion, which has a recess, in which the ratchet wheel is freely rotatable, whereas the C-shaped stepping pawl is pivoted to the rotor for cooperation with the ratchet teeth of the ratchet wheel, which also comprises gear teeth. To reduce the overall height, the transmitting means consisting of the ratchet wheel and the double-acting stepping pawl are accommodated within the guide length of the rotor axle. This arrangement eliminates the need for the previously required bridge for the self-winding mechanism, and the number of parts of the self-winding system is only one-half of the number previously required.

Because the double-acting stepping pawl is positively moved, a high reliability in operation is ensured in conjunction with a small dead shifting movement, so that a high efficiency results, whereas there is no need for a spring.

The idler gear means consist of a gear cluster having two superimposed gears, one of which is driven by means of the reversing gear by the drive pinion of the rotor when the same rotates in one sense, whereas the second gear of the gear cluster is driven by the gear teeth of the ratchet wheel, which is coupled to the rotor when the same rotates in the opposite sense, whereas the reversing gear is then disengaged. Hence, the gear cluster will transmit any movement of the rotor from either of its two gears at its upper part by means of a pinion disposed at its lower part in the plane of the watch movement. From the latter pinion, the winding movement is transmitted to the ratchet wheel of the spring barrel in known manner by speed-reducing and drive gears.

Further details of the self-winding mechanism according to the invention are shown in the drawings and will be described hereinafter.

FIG. 1 is a perspective view showing a self-winding mechanism according to the invention and

FIG. 2 is a transverse sectional view taken on line II—II in FIG. 1 through the movement.

FIGS. 3–5 are detail elevations showing the rotor-locking means according to the invention.

As is apparent from FIGS. 1 and 2 of the drawing, the rotor 1 is connected to the drive pinion 3, which is rotatably mounted on a guide pin 2, which thus serves as a rotor axle. During a rotation of the rotor in one sense A, the drive pinion 3 acts by means of the reversing gear 4 on the gear 5 of the idler gear means 6. During a rotation of the rotor in the opposite sense B, the normally freely rotatable ratchet wheel 7 is coupled to the rotor 1 by the engagement of the stepping pawl 9 with the ratchet teeth 8 of the wheel 7 so that the gear teeth 10 of the latter act on the second idler gear 11 of the idler gear means 6. The rotor 1 is pressed on the drive pinion 3, which is formed below its teeth with a recess, in which the ratchet wheel 7 is mounted for free rotation in one sense. The ratchet wheel 7 is provided in addition to the ratchet teeth 8 with gear teeth 10, and the C-shaped stepping pawl 9 is pivoted in the rotor 1 for cooperation with the ratchet teeth 8. Movements of the rotor in the two senses A and B are thus transmitted by the idler gear 6 in the same sense.

It has been stated that the gear cluster which forms the idler gear means 6 comprises the two superimposed gears 5 and 11. The drive pinion 3 of the rotor 1 acts on one gear 5 by means of the reversing gear 4. When the rotor 1 rotates in the opposite sense, the ratchet wheel 7 is coupled to the rotor 1 by the stepping pawl 9, and the gear teeth 10 of the ratchet wheel 7 act on the second gear 11 of the gear cluster 6, whereas the reversing gear 4 is then disengaged. Motion is transmitted from either of the two gears 5 and 11 of the gear cluster 6 to the pinion 12 disposed on the lower portion of the gear cluster in the plane of the watch movement. From that pinion, the winding movement is transmitted by the speed-reducing and drive gears 13, 14 to the ratchet wheel 15 of the spring barrel.

In accordance with FIG. 2, a substantial movement of the rotor 1 along the rotor axle 2 is prevented by a locking member 16, which is pivotally movable to a position in which its end finger 17 radially overlies the drive pinion 3. The locking member 16 is shown in three different positions in FIGS. 3 to 5. In its inner position, the locking member 16 radially overlies the reversing gear 4 and embraces the gear cluster serving as idler gear means 6 between the two gears 5 and 11 so that the reversing gear and gear cluster are held in position. When swung up in the direction C, the end finger 17 first releases the rotor 1 whereas the reversing gear 4 and the gear cluster 6 are still held against a substantial axial movement, as shown in FIG. 4. The elements 4 and 6 are released only when the locking member has been swung up further to the position shown in FIG. 5. Owing to this arrangement, the rotor 1 may be separately removed for service or repair, and the wheel bridge and the barrel bridge may be removed and reinstalled without need for a removal of the other parts of the self-winding mechanism.

The rotor-locking member 16 is formed at its free end with a bayonet slot 18, which has an arcuate por-

tion through which the shank of a screw **19** extends. The latter has a head provided on its underside with a centering cone **20**, which enters the enlarged circular portion of the slot **18** as the screw is tightened. As a result the locking member can be partly swung up to the position shown in FIG. **4** without need for a complete removal of the screw **19**. The rotor-locking member **16** is pivoted at **21**.

It is emphasized that in the operating condition of the watch, shown in FIG. **3**, the locking member **16** is in locking position but is not physically in contact with the rotating elements, as shown in FIG. **2**. The shafts carrying the rotating elements are mounted at opposite ends in bearings, in most cases in jewel bearings, so that they are rotatable with a minimum of friction. For service and repairs, the bearing-carrying bridges must be removed as well as the rotor so that the watch movement is rendered accessible. In the previously known watch movements provided with a self-winding mechanism, the other rotating parts of said mechanism had to be removed too in that case. In the mechanism embodying the invention, however, the locking member **16** can be used to hold the transmitting gears of the self-winding mechanism in position even when the rotor has been removed.

What is claimed is:

1. A self-winding mechanism for watch movements, which comprises

mounting means,

a rotor mounted on said mounting means for rotation in first and second senses,

a drive pinion coaxial to and non-rotatably connected to said rotor,

a ratchet wheel freely rotatably mounted on said rotor,

a stepping pawl mounted on said rotor and arranged to interengage with said ratchet wheel so as to couple the latter to said rotor for rotation in, and only in, said second sense,

idler gear means rotatably mounted on said mounting means,

a reversing gear radially floatingly mounted on said mounting means and in mesh with said drive pinion and arranged to mesh with said idler gear means to rotate the same in said first sense only during a rotation of said drive pinion in said first sense, and

means for transmitting motion from said ratchet wheel to said idler gear means to rotate the same in said first sense during a rotation of said rotor in said second sense.

2. A self-winding mechanism as set forth in claim **1** in which

said mounting means comprise an axle having a length portion guiding said rotor and

said ratchet wheel and stepping pawl are accommodated within the length of said length portion.

3. A self-winding mechanism as set forth in claim **1** in which

said rotor is pressed on said drive pinion,

said drive pinion has a recess, in which said ratchet wheel is freely rotatably mounted,

said stepping pawl is C-shaped and pivoted to said rotor, and

said means for transmitting motion comprise a gear which is coaxial to and non-rotatably connected to said ratchet wheel and in mesh with said idler means.

4. A self-winding mechanism as set forth in claim **1** in which

said idler gear means comprise coaxial first and second idler gears non-rotatably connected to each other,

said reversing gear is arranged to mesh with said first idler gear to rotate the same in said first sense only during a rotation of said pinion in said first sense, and

said means for transmitting motion comprise a gear which is coaxial to and non-rotatably connected to said ratchet wheel and in mesh with said second idler gear.

5. A self-winding mechanism as set forth in claim **4** in which said idler gear means comprise

an upper portion carrying said first and second idler gears and

a lower portion carrying an output pinion which is coaxial to and non-rotatably connected to said idler gears.

6. A self-winding mechanism as set forth in claim **4** which comprises

a locking member which is pivoted to said mounting means and pivotally movable to inner, intermediate, and outer positions,

said locking member being arranged in said inner position to radially overlap said drive pinion and to hold said drive pinion, rotor, ratchet wheel and idler gear means against a substantial axial movement,

said locking member being arranged in said intermediate position to be radially clear of said drive pinion, rotor, and ratchet wheel and to hold said idler gear means against a substantial axial movement,

said locking member being arranged in said outer position to be radially clear also of said idler gear means.

7. A self-winding mechanism as set forth in claim **6**, in which

said locking member is arranged in said intermediate position to hold also said reversing gear against a substantial axial movement and

said locking member is arranged in said outer position to be radially clear also of said reversing gear.

8. A self-winding mechanism as set forth in claim **6**, in which

said locking member has a free end formed with a bayonet slot, which comprises a curved narrow portion and an enlarged circular portion,

a screw extends through said bayonet slot and is threaded into said mounting means and has a shank which is adapted to extend through said narrow portion when said locking member is in said intermediate position, and a head disposed on the side of said locking member opposite to said mounting means and wider than said narrow and enlarged portions,

said screw further comprises a conical portion which tapers from said head to said shank and is adapted to enter said enlarged portion,

the smallest diameter of said conical portion is larger than the width of said narrow portion, and

said enlarged portion is arranged to receive said conical portion when said locking member is in said inner position.

9. A self-winding watch, which comprises

mounting means,

a rotor mounted on said mounting means for rotation in first and second senses,

a drive pinion coaxial to and non-rotatably connected to said rotor,

a ratchet wheel freely rotatably mounted on said rotor,

a stepping pawl pivoted to said rotor and arranged to interengage with said ratchet wheel so as to couple the latter for rotation in, and only in, said second sense,

idler gear means rotatably mounted on said mounting means,

a reversing gear floatingly mounted on said mounting means and in mesh with said drive pinion and arranged to mesh with said idler gear means to rotate the same in said first sense only during a rotation of said drive pinion in said first sense, and

means for transmitting motion from said ratchet wheel to said idler gear means to rotate the same in said first sense during a rotation of said rotor in said second sense.

10. A self-winding watch as set forth in claim **9**, which is a wrist watch for ladies.

11. A self-winding watch as set forth in claim **9**, in which

a mainspring barrel is mounted on said mounting means and comprises a ratchet wheel extending in a predetermined plane, which is at right angles to the axis of said idler gear means.

said idler gear means comprise an upper portion spaced from said predetermined plane and carrying first and second coaxial idler gears non-rotatably connected to each other and a lower portion carrying an output pinion which is coaxial to and non-rotatably connected to said idler gears,

gear means are provided for transmitting the rotation of said output pinion to said ratchet wheel of said mainspring barrel,

said reversing gear is arranged to mesh with said first idler gear to rotate the same in said first sense only during a rotation of said drive pinion in said first sense, and

said means for transmitting motion comprise a gear which is coaxial to and non-rotatably connected to said ratchet wheel mounted on said rotor and in mesh with said second idler gear.

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