

[54] **DRIVE MECHANISM FOR AN INDICATOR OF THE DAY OF THE MONTH IN A TIMEPIECE**

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[56]

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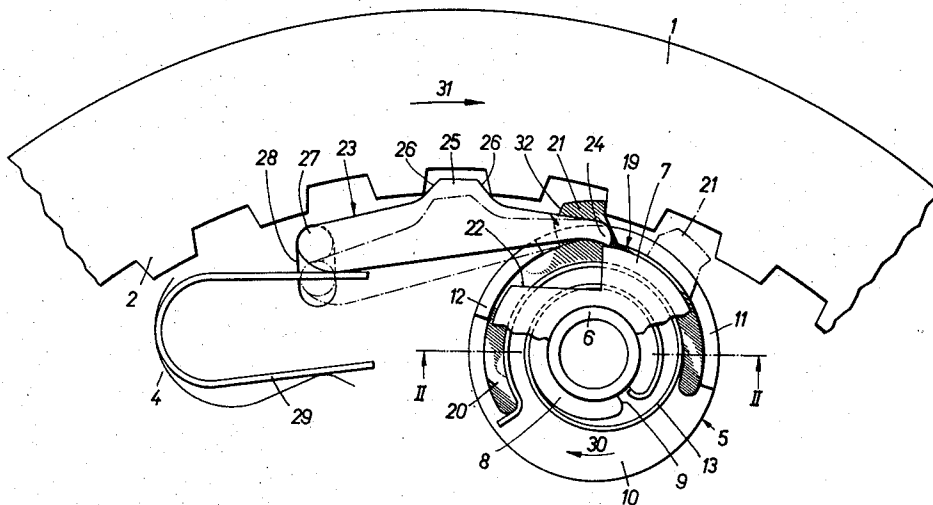
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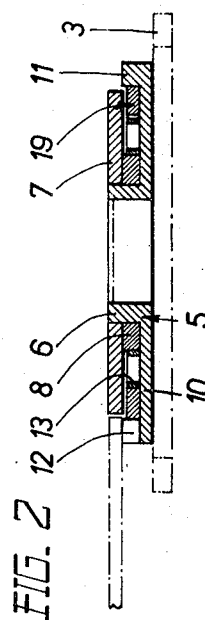
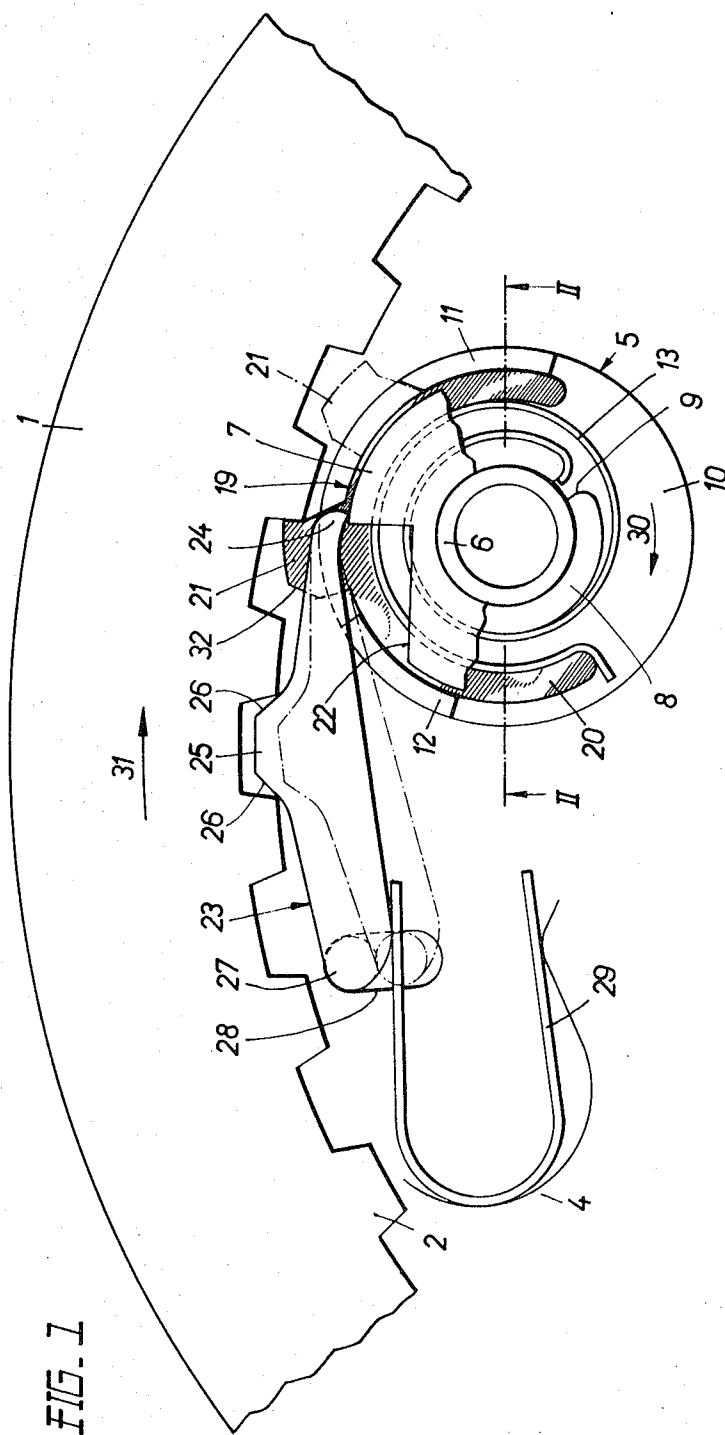
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ABSTRACT

In a timepiece having a date indicator, the driving mechanism therefor is connected to the 24-hour wheel, which is driven by the movement, through a spiral spring which gradually stores energy from the rotation of the 24-hour wheel and imparts the stored energy to the driving mechanism to advance the date indicator when the blocking mechanism restraining improper movement of the date indicator is released.

17 Claims, 2 Drawing Figures





DRIVE MECHANISM FOR AN INDICATOR OF THE DAY OF THE MONTH IN A TIMEPIECE

The present invention relates to a drive mechanism for an indicator of the day of the month (hereinafter referred to as the date indicator) in a timepiece comprising a 24-hour wheel driven by the movement, a cam connected to said wheel and a skipping mechanism (jumper) which is normally held by the cam in a position in which it blocks the indicator of the day of the month and is released at the moment when the indicator advances.

In mechanisms of this type which are already known, the means for driving the date indicator are connected to the drive wheel and move with the drive wheel in a continuous manner. The position of the drive means must therefore be adjusted with respect to the position of the cam so that the drive means come into contact with the date indicator and move it precisely at the moment when the skipping mechanism is released by the cam. In order to prevent the date indicator from stalling during that moment of time, the skipping mechanism is acted upon by a spring which keeps the tooth of the skipping mechanism engaged in the teeth of the date indicator so that when the drive means come into contact with the date indicator, the drive means should impart to the date indicator the energy which is needed to separate therefrom the tooth of the skipping mechanism against the action of the spring of the skipping mechanism. In order to prevent any risk of improper movement of the date indicator and to prevent blocking during that period of time when the date indicator should move, the spring of the skipping mechanism should then present, despite the locking of the cam, a relatively strong force, which burdens the motor at the moment when the date changes. However, a sudden overload on the motor of a watch could result in deviations in operation, particularly in the case of watches with a pendulum or balance wheel, because the overcharge causes a temporary drop in the amplitude of the oscillations of the balance wheel.

Furthermore, the known mechanisms mentioned above do not provide an instantaneous skipping or jump.

The object of the present invention is to provide a drive mechanism for the date indicator in which the force of the spring of the skipping mechanism can be reduced and, if necessary, this spring is even entirely eliminated so as not to burden the motor at the time when the date indicator advances and which, in addition, assures an instantaneous skipping of this element.

With this in view, the mechanism according to the present invention comprises a 24-hour wheel having a drive mechanism which is connected to the 24-hour wheel by resilient biasing means. During the course of the rotation of said wheel, the drive mechanism strikes against a tooth of the date indicator and then the resilient biasing means coils up to the time that the cam releases the skipping mechanism so as to bring about the advance of the indicator when the skipping device is released.

The attached drawing represents, by way of example, a type of design of the mechanism according to the invention.

FIG. 1 is a view from about and FIG. 2 is a cross-sectional view following line II—II of FIG. 1.

The mechanism shown in the drawing is intended to be housed in a wrist watch, for example, an electric wrist watch with a motorized balance wheel. The date indicator 1 is a circular crown presenting an internal gearing with 31 teeth. The days of the month which are carried by the crown 1 are not shown since they appear in a slot made in the dial, the latter extending above the mechanism shown in FIG. 1.

The mechanism comprises a drive wheel 3 shown as dashed lines in FIG. 2. The drive wheel is arranged in a known manner on the plate 4 of the movement between the gearing 2 and the barrel wheel for the hours (not shown). This drive wheel carries out a rotation each 24 hours. On its barrel there is driven a support disk 5, the hub 6 of which is engaged in the central opening of a cam 7. A washer 8 is driven onto the hub 6 and presents a shoulder onto which the cam 7 rests. This washer it-

self has a notch 9 at a point of its mount. It extends protruding from the plate 10, of circular shape, which is shown as the support 5. This plate itself has at its periphery two guiding elements 11 and 12 in an arc of a circle which protrude with respect to the washer 8. Together these guiding elements are within an arc of 180° along the periphery of the plate 10 and are separated by an empty portion of said arc, the extent of which is somewhat less than 90°. The support 5 and the cam 7 driven onto the hub 6 form together a sort of flat and circular box inside of which there are housed a spiral spring 13, the inside end of which is hooked into the notch 9, and a drive element 19 formed of a punched plate presenting a body in a crown arc 20 and in the center of this body a tooth 21 extending in a protruding manner towards the outside. The body 20 of the element 19 is kept normally supported against the guiding elements 11 and 12 by the external winding of the spring 13 so that it is then coaxial to the support 5 and to drive wheel 3. Furthermore, the outside extremity of the spring is bent and hooks onto an extremity of the body 20 so that the element 19 is normally connected in rotation to the wheel 3.

The cam 7 has a circular contour on an arc greater than 180°, more preferably, an arc of approximately 300° and on the rest of its periphery has a notch 22 intended for releasing the skipping mechanism 23. The latter element is a rigid piece of elongated shape the forward end 24 of which normally rests against the periphery of the cam 7. In the middle of its length on its outside, this skipping mechanism has a tooth 25 defined by two inclined planes 26 separated by a rectilinear edge. Lastly, at its rear end it has a pivoting pin 27 which is stamped, of cylindrical shape, which is engaged in an elongated opening 28 extending radially into the plate 4. This elongated opening could also be a simple groove. The hair-pin spring 29, housed in a groove of the plate 4, rests against the rear end of the skipping mechanism 23, the edge of the skipping mechanism and the shape of the spring being such that the line of action of the spring passes slightly ahead of the axis of the pivoting pin 27 so that normally the skipping mechanism is subjected to a very weak couple but which tends to make it pivot towards the inside of the movement.

The tooth 21 has a bevel 32 at its rear part to permit a tooth 2 of the ring of the date indicator 1 to cause a shift in the piece 19 at the time of the correction of the date after the skip when this tooth is still in the path of the teeth 2.

The operation of the mechanism which is just described is the following:

Normally, that is to say, when the tooth 21 of the element 19 is not engaged in the gearing of the crown of the date indicator 1, the spiral spring 13 keeps this notch resting against the rear end of the guiding element 11 and the entire unit of the wheel 3 and of the box formed by the cam 7 and the support 5 turn as a single unit. During this time the end 24 of the skipping mechanism 23 rests against the periphery of the cam 7 and the skipping mechanism blocks the crown of the date indicator 1 against any accidental displacement. When, during the course of its rotation in the direction of the arrow 30, the tooth 21 comes into contact with a side of one of the teeth 2, the spiral spring 13 starts to coil beyond its normal coiled position. During this period which corresponds to a displacement of about 30° from the cam 7, the load on the movement or motor increases slightly, but, since this period of time lasts about two hours it is possible to accumulate very gradually in the spring 13 the energy which is necessary for the following operation. The next operation takes place at the time when the notch 22 of the cam passes under the end 24. The forward end of the skipping mechanism 23 is then free while the tooth 21 exerts under the action of the spring 13 a considerable tangential force on the gearing 2 of the element 1. The angle of the tooth which is located immediately behind the tooth 25 rests on the inclined plane 26 and causes the skipping mechanism 23 to pivot despite the weak couple which is exerted by the spring 29. The crown 1 moves abruptly in the direction of the arrow 31 so that the tooth 21 enters the position represented by dashed lines in FIG. 1. It is blocked by the

rear end of the element 11 and holds back the crown 1 from any displacement greater than one step. After the jump skip of the element of the date indicator, the unit 7, 5, 3 continues its rotating movement so that the skipping mechanism is brought back to its blocking position when the notch 22 has completely passed under the end 24. In the meantime the teeth 21 and 25 assure the blocking of the ring of the date with a positive play which is however not great enough to create any reading difficulty.

The spring 29 and the slot 28 which permit a radial displacement of the rear end of the skipping mechanism 23 are only intended for permitting a correction in the position of the date indicator when the hands of the watch move. When the tooth 21 is outside of the gearing 2, the spring 29 is sufficient to exert a sufficient couple, for example, by means of a coaxial pinion to the winder shaft on the crown 1 in one direction or the other so that the action of the teeth 2 on the inclined planes 26 will make the skipping mechanism turn about the point of support formed by the end 24 against the cam 7. The skipping mechanism then assumes the position shown by the dashed lines in FIG. 1, then returns, under the action of the spring 29, to its blocking position after the crown of the date indicator has advanced by one step.

During the period of time when the tooth 21 is blocked against a tooth of the crown 1, the correction can only be possible in the direction of the arrow 31. The tooth which comes into contact with the tooth 21 rests against its outside edge and, since the element 19 can move sideways with respect to the drive wheel 3 and to the support 5 because the angle covered by the guiding elements 11 and 12 does not exceed 180°, it yields under the action of the spring 13 and stands aside to permit the crown to move. It will also stand aside after a correction after the skip as long as the tooth 21 is in the path of the teeth 2. The spring 13 is sufficiently strong so as to prevent an accidental skip of the date indicator even during this period.

The arrangement described makes it possible to create a sure blocking of the date indicator without the need of using a spring with great force considerably burdening the movement during the advance of the date indicator. The advantage thus obtained is considerable, particularly in the case of electric watches with a balance wheel.

It will also be noted that according to the shape given to the rear end of the skipping mechanism the line of action of the force of the spring 29 can be shifted to a certain extent and that small changes in the direction and in the position of this line of action make it possible to change the conditions of operation of the skipping mechanism. If necessary, the action of the spring 29 could be exerted behind the axis of pivot of the pin 27, which would result in imparting to the skipping mechanism a coupling force pressing it slightly against the cam. It is evident that such an arrangement would make it possible to impart to the inclined planes 26 a greater angle than in the case where the line of action is ahead of the pivoting point of the skipping mechanism and would bring about a further increase in the reliability of the mechanism against any accidental movement under the effect of a shock. Furthermore, this arrangement would facilitate the releasing of the skipping mechanism at the moment of the skip. If the line of action of the spring passed exactly through the axis of the pin 27, the skipping mechanism would then be free in the direction of the pivot at the time when its end 24 reaches the notch of the cam 7.

What is claimed is:

1. A mechanism for driving the date indicator in a timepiece comprising a 24-hour wheel driven by a movement, a cam operatively connected coaxially to said 24-hour wheel, a skipping mechanism having one end thereof engaging said cam and including means for contacting said date indicator for blocking the movement thereof, a driving mechanism including means for contacting and advancing said date indicator, guiding means for guiding said driving mechanism along a circular path coaxial to said 24-hour wheel, said cam having

means for releasing said skipping mechanism from contact with said date indicator so that said driving mechanism advances said date indicator, resilient biasing means for operatively connecting said driving mechanism to said wheel so that said driving mechanism rotates with said wheel during a portion of the rotation thereof and for storing energy from the other portion of the rotation of said wheel during which said contacting means of said driving mechanism is in contact with said date indicator and for releasing energy to said driving mechanism to advance said date indicator when said cam releases said skipping mechanism.

2. A mechanism according to claim 1 in which said cam has a cylindrical lateral surface coaxial to said wheel which surface extends over an arc greater than 180°, said cam further having a notch in the peripheral surface thereof between the ends of said surface extending over an arc greater than 180°, said one end of said skipping mechanism resting on the peripheral surface of said cam such that when said one end rests on the surface defining said notch said skipping mechanism is released from said date indicator.

3. A mechanism according to claim 2 in which said cylindrical lateral surface extends over an arc of approximately 300°.

4. A mechanism according to claim 1 in which said date indicator includes a row of gear teeth on one surface thereof on which said contact means of said skipping mechanism and of said driving mechanism act.

5. A mechanism according to claim 4, in which the 24-hour wheel has associated therewith two guiding abutments separated from one another and in which the contacting and advancing means of said drive mechanism includes a tooth extending between said abutments, said tooth engaging the gearing of the date indicator, the distance between said abutments and the width of said tooth being such that when the skipping mechanism is released by the cam the possible displacement of the date indicator is limited to an arc approximately equal to the pitch of the gearing of the date indicator.

6. A mechanism according to claim 5, in which said driving mechanism includes an element in the shape of a section of a ring wherein said tooth is connected to the outside surface thereof and in which the resilient biasing means is a spiral spring which is connected at one end to a hub of said wheel and at the other end to the inside surface of said element thereby maintaining said element resting against said abutments.

7. A mechanism according to claim 6, in which the guiding abutments connected to the driving wheel extend over an arc not exceeding 180° so as to permit a lateral movement of said driving mechanism with respect to the wheel.

8. A mechanism according to claim 4 further comprising means for allowing the end of the skipping mechanism opposite the end which engages said cam to move in a direction away from said gearing between two positions in one of which movement of said date indicator is blocked by said skipping mechanism and in the other position of which the skipping mechanism is released from said date indicator.

9. A mechanism according to claim 8, further comprising a pivoting pin in the end of the skipping mechanism opposite the end engaging said cam, said pin engaged in an elongated opening of limited length in a fixed element of said timepiece, and a spring operatively connected to said skipping mechanism so as to keep the pivoting pin at the extremity of said opening which is closest to the gearing of said indicator.

10. A mechanism according to claim 9, in which the contacting means of said skipping mechanism is a tooth located between the extremities of said skipping mechanism and in which the spring of the skipping mechanism acts on the latter at a location such that it subjects it to a coupling force pressing the tooth against the gearing of the indicator.

11. A mechanism according to claim 10, in which the tooth of the skipping device is defined by two inclined planes separated by a rectilinear edge and in contact with the angles of two adjacent teeth of the gearing of the date indicator.

12. A mechanism for driving the date indicator in a timepiece comprising a 24-hour wheel driven by a movement, a cam operatively connected to said wheel, a skipping mechanism having one end thereof engaging said cam and including means for contacting said date indicator for blocking the movement thereof, a driving mechanism including means for contacting and advancing said date indicator, said date indicator having a row of gear teeth on one surface thereof on which said contacting means of said skipping mechanism and of said driving mechanism act, said cam having means for releasing said skipping mechanism from contact with said date indicator so that said driving mechanism advances said date indicator, resilient biasing means for operatively connecting said driving mechanism to said wheel so that said driving mechanism rotates with said wheel during a portion of the rotation thereof and for storing energy from the other portion of the rotation of said wheel during which said contacting means of said driving mechanism is in contact with said date indicator and for releasing energy to said driving mechanism to advance said date indicator when said cam releases said skipping mechanism, and means for allowing the end of the skipping mechanism opposite the end which engages said cam to move in a direction away from said gearing between two positions in one of which movement of said date indicator is blocked by said skipping mechanism and in the other position of which the skipping mechanism is released from said date indicator, said mechanism further comprising a pivoting pin in the end of the skipping mechanism opposite the end engaging said cam, said pin engaged in an elongated opening of limited length in a fixed element of said timepiece, and a spring operatively connected to said skipping mechanism so as to keep the pivoting pin at the extremity of said opening which is closest to the gearing of said indicator.

13. A mechanism according to claim 12 in which the contacting means of said skipping mechanism is a tooth located between the extremities of said skipping mechanism and in which the spring of the skipping mechanism acts on the latter at a location such that it subjects it to a coupling force pressing the tooth against the gearing of the indicator.

14. A mechanism according to claim 13 in which the tooth of the skipping device is defined by two inclined planes separated by a rectilinear edge and in contact with the angles of two adjacent teeth of the gearing of the date indicator.

15. A mechanism for driving the date indicator in a timepiece comprising a 24-hour wheel driven by a movement, a cam operatively connected to said wheel, a skipping mechanism having one end thereof engaging said cam and including means for contacting said date indicator for blocking the movement thereof, a driving mechanism including means for contacting and advancing said date indicator, said date indicator having a row of gear teeth on one surface thereof on which said contacting means of said skipping mechanism and of said driving mechanism act, said cam having means for releasing said skipping mechanism from contact with said date indicator so that said driving mechanism advances said date indicator, resilient biasing means for operatively connecting said driving mechanism to said wheel so that said driving mechanism rotates with said wheel during a portion of the rotation thereof and for storing energy from the other portion of the rotation of said wheel during which said contacting means of said driving mechanism is in contact with said date indicator and for releasing energy to said driving mechanism to advance said date indicator when said cam releases said skipping mechanism, wherein the 24-hour wheel has associated therewith two guiding abutments separated from one another and in which the contacting and advancing means of said drive mechanism includes a tooth extending between said abutments, said tooth engaging the gearing of the date indicator, the distance between said abutments and the width of said tooth being such that when the skipping mechanism is released by the cam the possible displacement of the date indicator is limited to an arc approximately equal to the pitch of the gearing of the date indicator.

16. A mechanism according to claim 15 in which said driving mechanism includes an element in the shape of a section of a ring wherein said tooth is connected to the outside surface thereof and in which the resilient biasing means is a spiral spring which is connected at one end to a hub of said wheel and at the other end to the inside surface of said element thereby maintaining said element resting against said abutments.

17. A mechanism according to claim 16 in which the guiding abutments connected to the driving wheel extend over an arc not exceeding 180° so as to permit a lateral movement of said driving mechanism with respect to the wheel.

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