

DRIVE MECHANISM FOR A TIMEPIECE CALENDAR DATE
DISPLAY

The present invention relates to a drive mechanism for a day of the month display for a timepiece comprising a first indicator and a second indicator on which Figures are affixed respectively indicating the units and
5 tens of said day of the month, these indicators being driven by a program wheel set. The latter bears a day of the month wheel comprising thirty one teeth, this wheel being in turn driven by the beak of a lever so as to be moved one step forward by one calendar number change.

The mechanism described briefly in the paragraph above is well-
10 known in the art. This mechanism is fitted to a timepiece, called a large date timepiece where the day of month appears through a large aperture arranged in the timepiece dial. The date then appears in larger dimensions than if it were printed on a single ring making one revolution less and moving by approximately 11.5 degrees per day.

15 The first and second indicators respectively indicating the units and tens of the day of the month are driven by a program wheel set which is described in document WO 01/77756. This wheel set is arranged to drive the first indicator at the end of every day by one step except at the end of the thirty first day when it is not driven, and the second indicator by one step
20 at the end of the ninth, nineteenth, twenty-ninth and thirty first days of the month.

This program wheel set carries a day of the month wheel having thirty one teeth which is driven in a known manner by the beak of a lever controlled in turn either by the drive mechanism of the timepiece, or by a
25 manually actuated pusher when a need to correct of the date is felt. In both cases, the change of date takes place when the beak of the lever -

controlled manually or by the driving mechanism - penetrates between two teeth of the day of the month wheel and causes the latter to advance by one step.

Once the function is completed and due to the effect of a return
5 spring acting on the lever, the beak is extracted from the wheel toothing.

This constructive arrangement has a major disadvantage, that of the risk of one of the indicators racing. Indeed, as the correction of the date is carried out by means of a pusher and as the force exerted manually on this pusher is not constant but depends on the strength with which the latter is
10 pushed, the day of the month wheel and with it the program wheel set which is connected thereto can drive either the tens indicator, or the units indicator, as a result of said indicators, own inertia beyond the desired swing angle of a single step, consequently a progression of two units or only one unit can occur. For the tens indicator this danger exists if a
15 correction is made the ninth, nineteenth, twenty-ninth and thirty-first day of the month and for the units indicator if a correction is made the thirtieth day of the month. This necessarily results in a loss of synchronization between the two indicators, and this synchronization can be restored only by opening the timepiece to restore order.

20 To avoid the disadvantages described in the paragraph above, at least at the time of the passage from the twenty-ninth to the thirtieth then from the thirtieth to the first day of the next month, document WO 01/77756 cited above implements a ratchet and two pins which prevent from one or other of the indicators racing. This system is relatively complicated and
25 requires additional parts thus increasing the price of the timepiece.

The present invention prevents from one or other of the indicators racing whatever the date of the change of day of the month and without it being necessary to add any additional parts to the timepiece. In order to do so, day of the month display the drive mechanism, and in addition to
30 answering the description of the first paragraph of this description the drive mechanism is characterized in that between each change of day of the

month the beak of the lever is engaged between first and second teeth of the day of the month wheel and in that at the time of the change of day of the month said beak is initially disengaged from said first and second teeth to fall then between second and third teeth of said wheel and thereby drives
5 said wheel forward by one step.

The invention will now be described in detail based on the following description which is illustrated by the annexed drawings given by way of example of one embodiment and in which:

- Figure 1 shows the mechanism according to the invention in its
10 configuration between each change of day of the month,

- Figure 2 shows the mechanism according to the invention in its configuration at the beginning of a change of day of the month due to an action exerted on a correction pusher,

- Figure 3 shows the mechanism according to the invention in its
15 configuration at the beginning of a change of day of the month due to an action exerted by the timepiece movement, and

- Figure 4 shows the mechanism according to the invention in its configuration at the end of each change of day of the month.

The day of the month display drive mechanism is illustrated in the
20 Figures enumerated above. This day of the month display comprises two indicators. The first indicator 1 displays the units 3 of the day of the month and the second indicator 2 displays the tens 4 of said day of the month. Indicators 1 and 2 are mounted coaxially to each other, that of the tens being mounted inside that of the units. The date appears through a large
25 aperture arranged in the dial of the timepiece, indicators 1 and 2 being driven by a program wheel set P.

The program wheel set 8 drives first indicator 1 of the units 3 by one step at the end of every day except at the end of the thirty-first day when it is not driven. Thus Figures 3 and 4 show that unit indicator 1 is provided
30 with a star 25 having ten branches 26 meshing with a wheel 27 having thirty teeth 28, the latter being secured to the program wheel set P. Wheel 27 has

a space 29 with no teeth so that indicator 1 of units 3 is not driven when the date passes from the 31st of the month that is ending to the first of the following month, the number 1 remaining immobile and thus being used for both dates.

5 Program wheel set 8 is also arranged to drive second indicator 2 of tens 4 by one step at the end of the ninth, nineteenth, twenty ninth and thirty first days of the month. Thus, the Figures show that indicator 2 of tens 4 is provided with a pinion 30 having four branches 31 meshing with one of the four projecting parts 32 fixed to program wheel set 8, these projecting
10 parts being arranged on wheel set 8 to drive indicator 2 of tens 4 forward by one step at the end of the days referred to above.

 The Figures also show that program wheel set 8 carries a day of the month wheel 9 having thirty one teeth 10 regularly distributed around wheel 9. This day of the month wheel 9 is driven in turn by the beak 15 of a
15 lever 16. In the embodiment shown in the drawings, a return spring 17 acts on lever 16, the latter pivoting about an axis 18.

 Figure 1 shows the driving mechanism in its configuration between each change of day of the month. It is the rest position according to the original idea which makes present the invention, beak 15 of lever 16 is then
20 engaged between first and second teeth 11 and 12 of the day of the month wheel 9. This arrangement has a first obvious advantage, which is to block the mechanism and thereby make it insensitive to possible shocks exerted on the timepiece, which could inadvertently rotate the day of the month wheel between the change of date periods. This arrangement thus deviates
25 from that generally adopted in the prior art which consists in releasing the beak of the tothing of wheel 9, the insensitivity to shocks being assured only by one jumper spring 34 acting on the tothing. The engagement of beak 15 in the tothing of the day of the month wheel is ensured by the force of a return spring 17 which presses on lever 16. As shown in Figure 1,
30 the displayed date is the 24th.

Figure 2 shows the driving mechanism in its configuration at the beginning of a change of day of the month due to an action exerted on a correction pusher. In this Figure, the pusher itself is not shown, but a stem 21 which is associated thereto. This stem is biased by a spring 35.

5 Figure 2 shows that beak 15 of lever 16 is disengaged manually from the day of the month wheel 9 to correct the date. This release is carried out by means of stem 21 of the pusher. Stem 21 cooperates with a driving pin 22 mounted on lever 16 and makes this lever rotate clockwise when stem 21 moves in the direction of the arrow B via manual action exerted on the
10 pusher associated with this stem. At this moments beak 15 of lever 16 is thus disengaged from first and second teeth 11 and 12 and is presented opposite second and third teeth 12 and 13 of the day of the month wheel 9. As shown in Figure 2, the displayed date is still the 24th.

Figure 3 shows the driving mechanism in its configuration at the
15 beginning of a change of day of the month due to an action exerted by the timepiece movement. This is a change of day of the month such as it occurs at the end of each day. Here beak 15 of lever 16 is disengaged from the day of the month wheel 9 by a cam 19 driven by the timepiece movement, this cam 19 making a revolution in twenty-four hours while
20 turning in the direction of arrow A and cooperates with a finger 20 with which lever 16 is provided. As in the preceding case, the beak of the lever is disengaged from the first and second teeth 11 and 12 and is presented opposite the second and third teeth 12 and 13 of the day of the month wheel 9. As shown in Figure 3, the displayed date is still the 24th.

25 Figure 3 still shows that cam 19 has a first rising sector 23 with a small inclination. As cam 19 is rotating in the direction of arrow A, finger 20 of lever 16 starts by climbing this first sector 23, thereby rotating lever 16 clockwise to release its beak 15 from the toothing of the day of the month wheel 9. As shown in Figure 3, the release is maximum when the top of
30 finger 20 reaches the end of the first sector 23.

Figure 4 shows the driving mechanism in its configuration at the end of the change of day of the month. Figure 4 shows that beak 15 has fallen between the second and third teeth 12 and 13 of the day of the month wheel 9, which has made this wheel rotate clockwise and indicator 1 of the units 3 advance by one step, said indicator having then passed from the 4 to the 5, the displayed date having passed from the 24th to the 25th. The change of day of the month was caused either manually by releasing the pressure exerted on the pusher, or mechanically by the timepiece movement at the end of a day.

Figure 4 shows that stem 21 has returned to its rest position in the direction of the arrow C by releasing the manual pressure exerted on its pusher, this return being effected by the return spring 35. At this moment, biased by spring 17, lever 16 rotates in an anti-clockwise direction and its beak 15 lodges between second and third teeth 12 and 13 of wheel 9, thereby rotating this wheel by one step as described above.

Thus the change of day of the month by the correction pusher takes place not when this pusher is pressed, but when this pusher is released. This is the core of the invention i.e. the actuation force exerted on the day of the month wheel to drive it forward by one step only results from return spring 17 and no longer from the manual force exerted on the pusher. This manual force is not controllable and therefore not constant, whereas the force of a spring is perfectly constant and adjustable. As explained in the introduction of this description, the manual force exerted on the pusher can cause one or other of the indicators to race during a date correction and desynchronize one indicator with respect to the other, which means that the timepiece will have to be opened to restore this synchronization. According to the present invention, indicator racing is not possible since the force exerted by the return spring on the lever to achieve the change the day of the month is perfectly controllable and adjustable to prevent any possible racing.

Figure 3 also shows that cam 19 has a second descending sector 24 arranged substantially radially with respect to the axis of rotation 25 of the cam. The second sector 24 has an empty space in which finger 20 falls as soon as the cam continues to rotate in the direction of arrow A, i.e. at the moment of the day of the month change. The drop of finger 20 into the empty space of the cam causes lever 16 to rotate instantaneously in an anti-clockwise direction and causes beak 15 to penetrate between second and third teeth 12 and 13, thereby causing the instantaneous forward movement of the day of the month wheel and therefore, the instantaneous change of one or other of the indicators. The instantaneous passage of the day of the month at midnight has not been proposed yet, to the knowledge of the applicant, in large date display timepieces comprising trailing or semi-instantaneous mechanisms which require several tens of minutes to pass from one date to the other.

CLAIMS

1. Drive mechanism for a day of the month display of a timepiece, this day of the month display comprising first (1) and second (2) indicators on which Figures are affixed respectively indicating the units (3) and the tens (4) of said day of the month, these indicators being driven by a
5 program wheel set (8), said program wheel set itself carrying a day of the month wheel (9) having thirty one teeth (10), this day of the month wheel being driven in turn by the beak (15) of a lever (16) to make said day of the month wheel move forward by one step during a change of day of the month, wherein the beak (15) of lever (16) is engaged between first (11)
10 and second (12) teeth of the day of the month wheel (9) and wherein at the time of the day of the month change, said beak (15) is initially disengaged from said first (11) and second (12) teeth to fall then between the second (12) and third (13) teeth of said wheel (9) and thereby make said day of the month wheel move forward by one step.
- 15 2. Mechanism according to claim 1, characterized in that the program wheel set (8) is arranged to drive the first indicator (1) by one step at the end of every day except at the end of the thirty-first day when it is not driven, and the second indicator (2) by one step at the end of the ninth, nineteenth, twenty-ninth and thirty-first days of the month.
- 20 3. Mechanism according to claim 1, characterized in that the lever (16) pivots about an axis (18) and in that between each day of the month change, the beak (15) of this lever (16) is engaged and maintained between two teeth (11, 12) of the day of the month wheel (9) by the force of a return spring (17) pressing on said lever (16).
- 25 4. Mechanism according to claim 3, characterized in that the beak (15) of the lever (16) is disengaged from the day of the month wheel (9) at the end of each day by a cam (19) driven by the timepiece movement, this cam cooperating with a finger (20) with which the lever (16) is provided to make the day of the month wheel (9) move forward by one step.

5. Mechanism according to claim 4, characterized in that the cam (19) has a first rising sector (23) having a small inclination climbed by the finger (20) of the lever (16) before the day of the month change and a second descending sector (24) arranged substantially radially with respect to the axis of rotation (25) of the cam, this second sector (24) having an empty space in which said finger falls at the time of the day of the month change to rotate said lever, said lever moving the day of the month wheel forward instantaneously by one step.

6. Mechanism according to claim 3, characterized in that the beak (15) of the lever (16) is able to be disengaged manually from the day of the month wheel (9) to correct the date displayed by the timepiece, by means of a pusher (21), this pusher cooperating with a pin (22) with which the lever (16) is provided to move the day of the month wheel (9) forward by one step.