

TIMEPIECE COMPRISING AN IMPROVED TIME-SETTING DEVICE

The invention concerns a timepiece comprising an improved time-setting device.

5 The invention concerns more specifically a timepiece comprising a motion work which, via a minute wheel, drives analogue display means in rotation, and a time-setting device including a winding stem which, when it occupies a time-setting position, controls the rotation of the minute wheel in order to carry out a time-setting operation.

10 In a timepiece fitted with a movement comprising a large number of complications, it is practical for time-setting to be carried out in only one direction of rotation of the winding stem, preferably the clockwise direction. In fact, time-setting in the opposite direction can cause unanticipated movements of parts, for example in a strike mechanism and especially in a perpetual calendar mechanism, which often
15 leads to the deterioration of some elements of the movement. As the user still does not have a good understanding of how the timepiece and its complications work, it regularly happens that ill-advised manipulations, such as time-setting in the opposite direction, are carried out despite warnings, which means that the timepiece has to be returned to after-sales service.

20 It is also known from GB 1241936 a time-setting mechanism which does not have any winding wheel and comprising a rotatable stem, a section of which having a plane surface parallel to the axis of the stem, coupling means mounted on said section, said coupling means being rotatably connected to the stem and able to move between a direct coupling position with the minute wheel and an uncoupled position
25 from said wheel such that there is no intermediate wheel train between the coupling means and the minute wheel.

It is an object of the present invention to overcome these drawbacks by proposing a timepiece that enables the user to rotate the winding stem in both directions, in the time-setting position, without any risk of damaging the movement.

30 The invention therefore proposes a timepiece of the type described above, characterized in that the time-setting device includes a time-setting lever which carries a coupling device and whose pivoting is controlled by the winding stem, between an uncoupled position and a coupled position corresponding to the time-setting position of the winding stem, in that the coupling device comprises an exit pinion which, in the
35 coupled position, meshes with the minute wheel, and a plate that is pivotably mounted on the time-setting lever and which is provided with first and second reverser wheels with parallel axes meshing with each other, in that an intermediate wheel, which is

driven in rotation by the winding stem in the time-setting position, meshes with the first reverser wheel, and in that, in the coupled position:

- in a first direction of rotation of the winding stem, the plate occupies a first angular position in which the first reverser wheel meshes with a toothing arranged on the arbour of the exit pinion such that the minute wheel is driven in a determined
5 direction of rotation called the time-setting direction, and

- in a second direction of rotation of the winding stem, the plate occupies a second angular position in which the second reverser wheel meshes with a toothing arranged on the arbour of the exit pinion such that the minute wheel is driven in the
10 time-setting direction.

The timepiece according to the invention enables the user to set the time without worrying about the direction in which he has to rotate the winding stem. In whichever direction he rotates the winding stem, he always rotates the display means in the same direction, which removes the risk of a manipulation error during time-
15 setting and makes the timepiece easier to use.

According to another feature of the invention, the toothing arranged on the arbour of the exit pinion is formed by an entry pinion which is offset axially relative to the exit pinion, which facilitates arrangement of the time-setting device in the timepiece by minimising its space requirement.

Advantageously, the pivoting plate extends generally in a plane parallel to the time-setting lever, the reverser wheels are arranged on a bottom face of the pivoting plate, on the opposite side to the time-setting lever, and the plate is pivotably mounted on the time-setting lever by means of a pivot arranged on the top face of the plate. The pivot extends axially through a hole made in the time-setting lever so that the top
20 axial end thereof projects above the top face of the time-setting lever, the top axial end of the pivot includes an annular groove, and a fork is secured to the top face of the time-setting lever such that the annular groove receives the arms of the fork to hold the plate axially on the time-setting lever. A particularly simple pivoting system is thereby obtained with a minimum number of parts. The use of the fork allows the plate
25 to be pivotably secured without using additional screws or parts of complex shape, which facilitates assembly and dismantling of the coupling device.

Preferably, the pivoting axis of the time-setting lever is identical to the axis of rotation of the intermediate wheel which guarantees that the position of the first reverser wheel is properly adjusted relative to the intermediate wheel.

According to another feature of the invention, the winding stem includes a
35 coaxial time-setting pinion and, in the time-setting position, the time-setting pinion is connected in rotation to the winding stem and it meshes with a time-setting wheel

meshing with the intermediate wheel. The winding stem comprises a sliding coaxial pinion and, in the time-setting position, the sliding pinion meshes via an axial toothing with slots with a complementary toothing to the time-setting pinion in order to connect the time-setting pinion and the winding stem in rotation. This time-setting mechanism,
5 in particular via the use of the axial slotted toothing, allows a higher drive couple to be passed to the minute wheel, while minimising wear on the teeth used for meshing the sliding pinion and the time-setting pinion. The risk of slipping between the sliding pinion and the time-setting pinion is removed.

Preferably, the time-setting device comprises a pivoting pull-out piece which is
10 hinged on the winding stem such that the axial sliding of the winding stem towards the time-setting position controls the pivoting of the pull-out piece towards a time-setting position. The pivoting of the pull-out piece towards its time-setting position controls the sliding of the sliding pinion towards its time-setting position via a drive lever cooperating with the pull-out piece and with the sliding pinion, and it controls the
15 pivoting of the time-setting lever towards its coupled position. This control system has the advantage of being reliable and easy to assemble.

Other features and advantages of the present invention will appear more clearly upon reading the following detailed description, made with reference to the annexed drawings, given by way of non-limiting example and in which:

20 - Figure 1 is a flowchart which shows the main elements of the timepiece according to the invention;

- Figure 2 is a top view which shows the time-setting device of the timepiece of Figure 1 in the winding position;

- Figure 3 is a similar view to that of Figure 2 which shows the time-setting
25 device in the time-setting position and the coupling device fitted with the time-setting device when it occupies a first angular position;

- Figure 4 is a view of one detail of Figure 3 which shows the coupling device in a second angular position;

- Figure 5 is a side view which shows the time-setting device of Figure 3;

30 - Figure 6 is an exploded perspective view which shows the coupling device of Figure 3.

In the following description, an orthogonal marking V, L, T, respectively defining the vertical, longitudinal and transverse orientations, will be used in a non-limiting manner.

35 In the annexed Figures, the teeth of the gear trains are not systematically shown, in order to simplify the drawings and facilitate comprehension of the Figures.

Figure 1 shows a timepiece 10 in the form of a flowchart. Timepiece 10 is

preferably formed by a wristwatch fitted with a mechanical watch movement that is provided with a motion work 12 driving in rotation analogue display means 14, such as hands, via a minute wheel 16, shown in particular in Figure 2.

Timepiece 10 also comprises a time-setting device 18 that cooperates with
5 motion work 12, by coupling with the minute wheel 16 in order to alter the time indicated by display means 14. Time-setting device 18 is controlled by a manual control member such as a winding crown 20.

Time-setting device 18 is shown in more detail in Figures 2 to 4. It comprises a
10 winding stem 22 that slides along a longitudinal axis A1 orientated, in a non-limiting manner, from the interior towards the exterior, which corresponds to an orientation from left to right in Figure 2. Winding crown 20 is to be secured to the outer axial end 24 of winding stem 22 in order to allow the user, on the one hand, to control rotation of the winding stem 22 about its axis A1 and, on the other hand, to control the axial sliding (A1) of winding stem 22.

15 Winding stem 22 has at least two distinct axial positions, a neutral position inwards, called the winding position Pr, and a position pulled outwards, called the time-setting position Ph, these two positions Pr and Ph being shown respectively in Figures 2 and 3. The function of these two positions will be explained hereafter.

In the following description, the pivoting and rotational axes mentioned are,
20 unless otherwise indicated, substantially vertical, which corresponds to the orientation of the axes of motion work 12.

The pivoting of a pull-out piece 26 is controlled by winding stem 22. The pull-out piece 26 pivots about a fixed arbour A2, on the opposite side to its free end 28, and it includes a mobile articulation pin A3, which is arranged on the winding stem 22
25 and which is secured to winding stem 22 as the latter slides axially. Articulation pin A3 is arranged here between fixed arbour A2 and the free end of pull-out piece 26.

A sliding pinion 30, which is coaxial and secured in rotation to winding stem 22, is guided by sliding longitudinally on winding stem 22 between a winding position Pr in which its inner end 32 meshes with a winding stem 34 coaxial to winding stem 22, and
30 time-setting position Ph in which its outer end 36 meshes with a time-setting pinion 38 coaxial to winding stem 22. Sliding pinion 30 meshes here with winding pinion 34 via a toothing with unsymmetrical teeth.

Winding pinion 34 and time-setting pinion 38 are mounted to rotate freely on winding stem 22, sliding pinion 30 being used to connect one or other of these two
35 pinions 34, 38 to winding stem 22 in rotation.

According to an advantageous embodiment, sliding pinion 30 meshes with time-setting pinion 38 via an axial slotted toothing, the profile of teeth 40 being

substantially rectangular. Each tooth 40 has the overall shape of a cube.

The intermediate section of sliding pinion 30 is provided with an annular peripheral groove 42 which is provided for receiving in an articulated manner the free end 44 of drive finger 46 belonging to a swan-neck shaped drive lever 48. Drive lever 48 pivots about a fixed pin A4 and comprises a control arm 50 fitted with a pin 52 which is drawn elastically to abut against an inner surface 54 of pull-out piece 26, in proximity to the free end 28 of pull-out piece 26. Drive lever 48 here includes a resilient tongue 56, which is kept deformed resiliently against a fixed element in order to draw pin 52 against pull-out piece 26. Thus, when pull-out piece 26 pivots towards the time-setting position Ph, drive lever 48 pivots, which drives sliding pinion 30, by means of drive finger 46, outwards, i.e. towards time-setting position Ph.

Time-setting pinion 38 meshes with a time-setting wheel 58 which here extends in a horizontal plane, underneath winding stem 22. Time-setting wheel 58 meshes with an intermediate wheel 60 with an arbour A5.

According to the embodiment shown here, the fixed element against which resilient tongue 56 abuts is formed by arbour A5 of intermediate wheel 60.

According to the teaching of the invention, time-setting device 18 comprises a time-setting lever 62 which carries a coupling device 64, shown in detail in Figure 6, and the pivoting of which is controlled about an arbour A5 by winding stem 22, between an uncoupled position Pd and a coupled position Pe respectively corresponding to the winding position Pr and the time-setting position Pr of winding stem 22.

Time-setting lever 62 is here pivotably mounted about arbour A5 of intermediate wheel 60. According to the embodiment shown, it extends overall along a general direction D1 contained within a horizontal plane and it comprises, on either side of its pivoting arbour A5, a first arm 66 which extends on the side of winding stem 22 and a second arm 68 which extends on the side opposite winding stem 22 and which carries coupling device 64 at the free end thereof.

The free end of first arm 66 is fitted here with a pin 70 which is arranged on the top surface 72 of lever 24 and which is drawn resiliently to abut against the inner surface 54 of the free end 28 of pull-out piece 26, when pull-out piece 26 occupies its winding position Pr.

According to an alternative embodiment (not shown), pin 70 can be arranged on an intermediate lever whose pivoting is controlled by pull-out piece 26 and which abuts against time-setting lever 62 to control the pivoting of time-setting lever 62 towards the coupled position Pe.

Coupling device 64 also includes a drive arbour 74 of axis A6 which is

provided, at its bottom end, with an entry pinion 76 and, at its top end, with an exit pinion 78 providing for meshing with the minute wheel 16, when time-setting lever 62 is occupying its coupled position Pe. The two pinions 76, 78 are secured in rotation to drive arbour 74.

5 Drive arbour 74 is mounted to rotate freely on time-setting lever 62. Time-setting lever 62 therefore includes a bottom eyelet 80 that is offset orthogonally relative to the general direction D1 and which extends into the plane of time-setting lever 62 to carry bottom bearing 82 of drive arbour 74. A support piece 84, which includes a top eyelet 86 is secured to the top face 72 of time-setting lever 62 to carry
10 the top bearing 88 of drive arbour 74.

Entry pinion 76 is arranged here underneath bottom eyelet 80 and exit pinion 78 is arranged here above top eyelet 86. The two pinions 76, 78 are thus shifted axially (A6) in relation to each other on drive arbour 74.

Coupling device 64 also includes a plate 90 which is pivotably mounted about
15 an axis A7 on the bottom face 92 of time-setting lever 62 and which is provided with first and second reverser wheels 94, 96 of parallel axes A8, A9 meshing with each other, the first reverser wheel 94 also meshing with intermediate wheel 60.

In the coupled position, along the direction of rotation of intermediate wheel 60, which depends upon the direction of rotation of winding stem 22, plate 90 occupies,
20 either a first angular position in which it is second reverser wheel 96 that meshes with entry pinion 76, which corresponds to the position shown in Figure 3, or a second angular position in which it is the first reverser wheel 94 that meshes with entry pinion 76, which corresponds to the position shown in Figure 4.

Entry pinion 76 forms a drive toothing that drives exit pinion 78 in rotation via
25 one or other of reverser wheels 94, 96.

According to an advantageous embodiment, plate 90 extends overall in a plane parallel to time-setting lever 62 and reverser wheels 94, 96 are arranged on the bottom face 98 of plate 90. Plate 90 is pivotably mounted on time-setting lever 62 by means of a pivot 100 arranged on the top face 102. Pivot 100 extends axially (A7)
30 through a hole 104 made in time-setting lever 62 such that the top axial end 106 thereof projects above the top face 72 of lever 62. The top axial end 106 of pivot 100 comprises an annular groove 108 and a fork 110 is fixed to the top face 72 of time-setting lever 62 such that the two arms 112, 114 of fork 110 are received in annular groove 108 of pivot 100 to hold plate 90 axially on time-setting lever 62.

35 The operation of time-setting device 18 of timepiece 10 according to the invention will now be explained starting from winding position Pr of Figure 2.

In winding position Pr, sliding pinion 30 secures winding stem 22 to winding

pinion 34 in rotation to allow the movement of timepiece 10 to be wound. Time-setting pinion 38 is free to rotate relative to winding stem 22 and time-setting lever 62 occupies its uncoupled position Pd, such that exit pinion 78 is radially removed from minute wheel 16.

- 5 When the user wishes to set the time, he grasps winding crown 20 in order to slide longitudinally A1 the winding stem 22 outwards to its time-setting position Ph. By sliding outwards, winding stem 22 causes pull-out piece 26 to pivot, in the anti-clockwise direction looking at Figure 2.

10 Since pin 52 of drive lever 48 is drawn to abut against pull-out piece 26 by resilient tongue 56, the pivoting of pull-out piece 26 causes drive lever 48 to pivot, here in the clockwise direction, and drive finger 46 causes sliding pinion 30 to slide longitudinally A1 into its time-setting position Ph in which it meshes with time-setting pinion 38.

15 Simultaneously, while sliding outwards, winding stem 22 causes time-setting lever 62 to pivot towards its coupled position Pe, via the effect of a resilient element 116, which draws pin 70 against pull-out piece 26.

 In the time-setting position Ph and in coupled position Pe, the user can set the time of display means 14 by rotating winding stem 22 about its axis A1 by mean of winding crown 20.

20 In a first direction of rotation of winding stem 22, time-setting pinion 38 drives intermediate wheel 60, via time-setting wheel 58, for example in the clockwise direction, looking at Figure 3. The first reverser wheel 94 then rotates in the anti-clockwise direction and it is drawn against entry pinion 76 such that plate 90 occupies its second angular position (Figure 4). The first reverser wheel 94 then drives exit
25 pinion 78, via entry pinion 76, in the clockwise direction, which drives in minute wheel 16 in rotation in the time-setting direction Sh which is the anti-clockwise direction looking at Figure 3.

 If the user changes the direction of rotation of winding stem 22, time-setting pinion 38 then drives intermediate wheel 60 in the anti-clockwise direction. First
30 reverser wheel 94 then rotates in the clockwise direction and it rolls over intermediate wheel 60 causing plate 90 to pivot to its first angular position in which second reverser wheel 96 is drawn against entry pinion 76. First reverser wheel 94 then drives second reverser wheel 96 in the anti-clockwise direction. Second reverser wheel 96 drives exit pinion 78, via entry pinion 76, in the clockwise direction, which drives minute wheel 16
35 in the same time-setting direction Sh as before.

 Thus, in whichever direction the user rotates winding stem 22, including if he changes direction during the time-setting operation, minute wheel 16 and the

analogue display member still rotate in the same direction, thus removing any risk of manipulation error.

When the user pushes winding stem 22 back to its winding position Pr, the elements of time-setting device 18 return to their initial pre-time-setting position.

CLAIMS

1. Timepiece (10) including a motion work (12) which drives in rotation analogue display means (14) via a minute wheel (16), and a time-setting device
5 including a winding stem (22) which, when it is occupying a time-setting position (Ph) controls the rotation of the minute wheel (16) in order to carry out a time-setting operation, characterized in that the time-setting device (18) includes a time-setting lever (62) that carries a coupling device (64) and the pivoting of which is controlled by the winding stem (22) between an uncoupled position (Pd) and a coupled position (Pe)
10 corresponding to the time-setting position (Ph) of the winding stem (22), in that the coupling device (62) includes an exit pinion (78) which, in the coupled position (Pe), meshes with the minute wheel (16) and a plate (90) which is pivotably mounted on the time-setting lever (62) and which is provided with first and second reverser wheels (94, 96) of parallel axes (A8, A9) meshing with each other, in that an intermediate
15 wheel (60), which is driven in rotation by the winding stem (22) in the time-setting position (Ph), meshes with the first reverser wheel (94), and in that, in the coupled position (Pe):

- in a first direction of rotation of the winding stem (22), the plate (90) occupies a first angular position in which the first reverser wheel (94) meshes with a toothing (76) arranged on the arbour (A6) of the exit pinion (78) such that the minute wheel (16) is driven in rotation in a determined direction of rotation called the time-setting direction (Sh), and
20

- in a second direction of rotation of the winding stem (22), the plate occupies a second angular position in which the second reverser wheel (96) meshes with the toothing (76) arranged on the arbour (A6) of the exit pinion (78) such that the minute wheel (16) is driven in the time-setting direction (Sh).
25

2. Timepiece (10) according to the preceding claim, characterized in that the toothing (76) arranged on the arbour (A6) of the exit pinion (78) is formed by an entry pinion (76) which is offset axially relative to the exit pinion (78).

30 3. Timepiece (10) according to any of the preceding claims, characterized in that the plate (90) extends overall in a parallel plane to the time-setting lever (62), in that the reverser wheels (94, 96) are arranged on a bottom face (98) of the plate (90), on the opposite side to the time-setting lever (62), and in that the plate (90) is pivotably mounted on the time-setting lever (62) by means of a pivot (100) arranged
35 on the top face (102) of the plate (90).

4. Timepiece (10) according to the preceding claim, characterized in that the pivot (100) extends axially through a hole (104) made in the time-setting lever (62)

such that the top axial end (106) thereof projects above the top face (72) of the time-setting lever (62), in that the top axial end (106) of the pivot (100) includes an annular groove (108), and in that a fork (110) is secured to the top face (72) of the time-setting lever (62) such that the arms (112, 114) of the fork (110) are accommodated in the
5 annular groove (108) in order to hold the plate (90) axially on the time-setting lever (62).

5. Timepiece (10) according to any of the preceding claims, characterized in that the pivoting axis (A5) of the time-setting lever (62) is identical to the axis (A5) of rotation of the intermediate wheel (60).

10 6. Timepiece (10) according to any of the preceding claims, characterized in that the winding stem (22) includes a coaxial time-setting pinion (38) and in that, in the time-setting position (Ph), the time-setting pinion (38) is connected to the winding stem (22) in rotation and meshes with a time-setting wheel (58) meshing with the intermediate wheel (60).

15 7. Timepiece (10) according to the preceding claim, characterized in that the winding stem (22) includes a coaxial sliding pinion (30) and in that, in the time-setting position (Ph), the sliding pinion (30) meshes via a slotted toothing with a complementary toothing of the time-setting pinion (38) so as to connect the time-setting pinion (38) and the winding stem (22) in rotation.

20 8. Timepiece (10) according to the preceding claim, characterized in that the time-setting device (18) includes a pivoting pull-out piece (26) which is hinged on the winding stem (22) such that the axial sliding of the winding stem (22) towards the time-setting position (Ph) controls the pivoting of the pull-out piece (26) towards a time-setting position (Ph), and in that the pivoting of the pull-out piece (16) towards
25 the time-setting position thereof (Ph) controls the sliding of the sliding pinion (30) towards the time-setting position thereof (Ph) via a drive lever (48) cooperating with the sliding pinion (30).

9. Timepiece (10) according to any of the preceding claims, characterized in that the time-setting device (18) includes a pivoting pull-out piece (26) which is hinged on the winding stem (22) such that the axial sliding of the winding stem (22) towards the time-setting position thereof (Ph) controls the pivoting of the pull-out piece (22) towards the time-setting position (Ph) thereof, and the pivoting of the pull-out piece (26) towards the time-setting position thereof (Ph) controls the pivoting of the time-setting (62) lever towards the coupled position (Pe) thereof.