

PATENT SPECIFICATION

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(54) CALENDAR MECHANISM FOR A TIMEPIECE

(71) We, KABUSHIKI KAISHA DAINI SEIKOSHA, a Japanese body corporate of 6-31-1, Kameido, Koto-ku, Tokyo, Japan, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention concerns a calendar mechanism for a timepiece such, for example, as a watch.

A calendar mechanism for a timepiece is known comprising a wheel having a cylindrical portion and a gear portion, a day star wheel rotatably mounted on the said cylindrical portion, and a positioning plate which overlaps the said gear portion to limit axial movement of the latter in a predetermined direction. In the known construction, however, the positioning plate is interposed between the day star wheel and the said gear portion. As a result, the thickness of the calendar mechanism, and consequently of the whole timepiece, is unnecessarily great.

According to the present invention, there is provided a calendar mechanism for a timepiece comprising an hour wheel having a cylindrical portion and a gear portion, a day star wheel rotatably mounted on the said cylindrical portion, the maximum diameter of the day star wheel being less than that of the said gear portion, and a positioning plate which overlaps the said gear portion to limit axial movement of the latter in a predetermined direction, the positioning plate extending around at least a part of the day star wheel.

The positioning plate may be fixed to a base plate by at least one connector means, the width of the positioning plate being reduced in at least one region to enable the positioning plate to bend within its own plane in response to strain introduced by said connector means.

The or each connector means may com-

prise a screw having a head disposed wholly within a hole in the positioning plate.

The positioning plate may have a peripheral portion which overlaps a part of a date wheel to limit axial movement of the latter in the said predetermined direction.

The said part of the date wheel may be connected by a curved portion to a step portion of the date wheel, the step portion being disposed adjacent to the said peripheral portion of the positioning plate, the said peripheral portion having chamfered parts which are spaced from the said curved portion.

The positioning plate may have depressions therein to strengthen the positioning plate.

There may be provided a day correcting lever for correcting the day star wheel, the day correcting lever being disposed between the positioning plate and a minute wheel.

The invention also comprises a timepiece provided with a calendar mechanism as set forth above.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

Figure 1 is a broken-away cross-sectional view of a known calendar mechanism for a timepiece,

Figure 2 is a broken-away cross-sectional view of a calendar mechanism for a timepiece in accordance with the present invention,

Figure 3 is a perspective view of a positioning plate which forms part of the structure shown in Figure 2,

Figures 4 and 5 are broken-away cross-sectional views illustrating the relationship between the said positioning plate and a correcting lever, and

Figure 6 is a perspective view showing the relationship between a wheel forming part of the calendar mechanism and the said correcting lever, the positioning plate being

omitted from Figure 6 in order to simplify the drawing.

Terms such as "upper" and "lower", as used in the description below, are to be understood to refer to directions as seen in the accompanying drawings.

In Figure 1 there is shown a known calendar mechanism for a timepiece, comprising an hour wheel 1 having a cylindrical portion 1a and a gear portion 1b. Rotatably mounted on the cylindrical portion 1a is a day star wheel 3, the day star wheel 3 being secured to a day calendar dial 5. The gear portion 1b is supported by a base plate 6 which also supports a peripheral portion 4a of a date wheel 4.

Interposed between the day star wheel 3 and the gear portion 1b is a positioning plate 2 which limits axial movement of the gear portion 1b in a direction towards the day star wheel 3. The peripheral portion 2a of the positioning plate 2 is disposed adjacent to an inner peripheral wall or step portion 4b of the date wheel 4. The peripheral portion 2a overlaps the peripheral portion 4a of the date wheel 4 so as to limit movement of the latter in a direction away from the base plate 6. The maximum diameter of the day star wheel 3 is greater than that of the gear portion 1b.

As a result of the disposition of the positioning plate 2 between the day star wheel 3 and the gear portion 1b, the distance h_1 between the upper surface of the base plate 6 and the upper surface of the day calendar dial 5 is unduly great. It is desirable to reduce this distance in order to make the watch thinner.

In Figure 2 there is therefore shown a calendar mechanism for a timepiece according to the present invention comprising a date wheel 7 having a step portion 8 adjacent its inner periphery. The date wheel 7 has an inner peripheral part 7a which is connected by a curved portion 30 to the step portion 8, the inner peripheral part 7a being supported by a base plate 22. The main portion of the date wheel 7, the step portion 8, and the base plate 22 together define a space 10 which is disposed radially outwardly of the step portion 8. The step portion 8, the base plate 22 and a day calendar dial 19 together define a space 9 which is disposed radially inwardly of the step portion 8.

Rotatably mounted in the space 9 is an hour wheel 11 having a gear portion 12 which is mounted on the base plate 22, the hour wheel 11 having a cylindrical portion 13. Rotatably mounted on the cylindrical portion 13 and disposed within the space 9 is a day star wheel 14 which is mounted on the upper surface of the gear portion 12. The maximum diameter r of the day star wheel 14 is less than the maximum diameter R of the gear portion 12, so that the outer

periphery 12a of the gear portion 12 extends radially outwardly of the outer periphery 14a of the day star wheel 14.

A positioning plate 16 has an internal peripheral portion 16a which overlaps the gear portion 12 to limit axial movement of the latter in a direction away from the base plate 22. The positioning plate 16, which is disposed closely adjacent to the upper surface of the gear portion 12, extends around a part of the outer periphery of the day star wheel 14, the lower surface of the positioning plate 16 lies substantially in the same plane as the lower surface of the day star wheel 14 and lies substantially in the same plane as the upper surface of the gear portion 12.

The positioning plate 16 has an external peripheral portion 16b which extends adjacent to the step portion 8 of the date wheel 7 and which overlaps the inner peripheral part 7a of the latter. The external peripheral portion 16b is provided with a plurality of angularly spaced apart projections 18 which engage or are disposed closely adjacent to the step portion 8. The projections 18 serve to position the date wheel 7 radially of the hour wheel 11.

Either the whole of the external peripheral portion 16b of the positioning plate 16 may be disposed above the inner peripheral part 7a of the date wheel 7, or if desired only a part of the external peripheral portion 16b may overlap the inner peripheral part 7a. Thus the positioning plate 16 positions both the gear portion 12 and the inner peripheral part 7a.

The day calendar dial 19 is fixed by a ring 20 to the day star wheel 14 so as to rotate at all times in unison therewith.

The positioning plate 16 is fixed to the base plate 22 by means of a plurality of set screws 21.

In the construction shown in Figure 2, the positioning plate 16, while overlying the gear portion 12 so as to position the latter, extends around a part of the day star wheel 14, this being possible because the maximum diameter r of the day star wheel 14 is less than the maximum diameter R of the gear portion 12. This is in contrast to the arrangement shown in Figure 1 in which the positioning plate 2 does not extend around a part of the day star wheel. Consequently in the construction shown in Figure 2, the distance h_2 between the upper surface of the base plate 22 and the upper surface of the day calendar dial 19 is substantially less than the corresponding distance h_1 of the construction shown in Figure 1. This enables the thickness of the timepiece to be reduced.

As a result of this reduction in the thickness of the calendar mechanism of Figure 2, the space 23 between the day

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calendar dial 19 and the positioning plate 16 is very small in the axial direction and it is therefore important that the screws 21 which are used to secure the positioning plate 16 to the base plate 22 do not extend into the space 23. With this object, each of the screws 21 has a frusto-conical shaped head which is disposed wholly within a hole 27 in the positioning plate 16. The heads of the said screws 21 are therefore spaced from the day calendar dial 19 and do not impede rotation of the latter.

As shown in Figure 3, the positioning plate 16 is provided at its internal peripheral portion 16a with grooves or notches 24a, 25a, 25'a and 26a, the external peripheral portion 16b of the positioning plate 16 being provided with grooves or notches 24b, 25b, and 26b which are substantially aligned respectively with the corresponding grooves or notches of the internal peripheral portion 16a. The positioning plate 16 therefore has a reduced width portion 24 disposed between the grooves or notches 24a, 24b, a reduced width portion 25 disposed between the grooves or notches 25a, 25'a and the groove or notch 25b, and a reduced width portion 26 disposed between the grooves or notches 26a, 26b.

The base plate 22 is provided with a plurality of hollow pins 28 each of which is internally threaded at 29. Each of the screws 21 is threaded into a hollow pin 28, and it is thus important that the centres of the holes 27 in the positioning plate 16 should coincide with the centres of the hollow pins 28. However, if in fact there is some lack of coincidence between the centres of the holes 27 and the centres of the hollow pins 28, then the provision of the reduced width portions 24 to 26 of the positioning plate 16 enables the latter to bend in its own plane in response to strain introduced by screwing the positioning plate 16 to the base plate 22. For example, if the axes of the internal threads 29 of the hollow pins 28 are nearer to the internal peripheral portion 16a of the positioning plate 16 than are the centres of the holes 27, then the positioning plate 16 will be bent towards the centre of the base plate 22 when the set screws 21 are screwed into the hollow pins 28. The positioning plate 16 will not however be deflected axially of the base plate 22 as a result of being so bent because the positioning plate 16 will merely be horizontally bent at the reduced width portions 24 to 26. As a result it is not necessary for a big space 23 to be provided between the day calendar dial 19 and the positioning plate 16, and this enables the thickness of the timepiece to be further reduced.

The step portion 8 which extends about the whole of the internal periphery of the date wheel 7 is formed by a pressing

operation which produces the curved portion 30 between the inner peripheral part 7a of the date wheel 7 and the step portion 8. The projections 18 are provided with chamfered surfaces 18a to ensure that the projections 18 do not make contact with the curved portion 30. This enables the positioning plate 16 to be disposed immediately adjacent to the inner peripheral part 7a of the date wheel 7, which also assists in reducing the overall size of the timepiece.

The positioning plate 16 is provided with a plurality of angularly spaced apart depressions 31 each of which, in plan, is constituted by an oval shaped groove. The depressions 31 serve to strengthen the positioning plate 16 by increasing its bending strength.

When an hour hand (not shown) is removed from the cylindrical portion 13 of the hour wheel 11, the latter is moved and as a result the positioning plate 16 is pressed upwardly by the gear portion 12. The provision of the plurality of depressions 31, however, ensures that the positioning plate 16 is not easily bent. The positioning plate 16 thus continues to position the hour wheel 11 and thus prevents the latter from becoming disengaged with another wheel (not shown).

As will be appreciated, the depressions 31 need not necessarily have the shape shown in Figures 2 and 3, and need not be provided only adjacent the internal peripheral portion 16a of the positioning plate 16.

As shown in Figure 4, a day correcting lever 34 is disposed beneath the positioning plate 16 and is disposed in the space between the positioning plate 16 and a minute wheel 32. The day correcting lever 34 is provided for effecting correction of the day star wheel 14. The minute wheel 32 is provided on its upper surface with a minute wheel pinion 35 which meshes with the gear portion 12 of the hour wheel 11. When a clutch wheel 36 (best shown in Figures 5 and 6) is rotated in the direction of the arrow C of Figure 6, a cam portion 38 of a cam plate 39 engages the correcting lever 34 so as to cause the latter to slide in the direction indicated by the arrow A in Figure 6. The correcting lever 34 has a finger 37 extending therefrom, and when the correcting lever 34 is moved in the direction of the arrow A, the finger 37 engages a tooth of the day star wheel 14 to rotate the latter in the direction of the arrow B shown in Figure 6. As a result of this rotation of the day star wheel 14 through one tooth space, the day calendar dial 19 is also rotated in the direction of the arrow B. The day calendar dial 19 is provided with indicia 19a (only one indicium being shown) representing the days of the week. Thus the particular indicium 19a shown in Figure 6 is a Japanese character

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representing Monday.

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In a conventional timepiece, both the day star wheel and the day correcting lever are disposed above the positioning plate. In the embodiment shown in the drawings, however, the correcting lever 34 is disposed in the space between the positioning plate 16 and the minute wheel 32 thus helping to reduce the thickness of the timepiece as much as possible.

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In the embodiment of the present invention shown in the drawings, both the days star wheel 14 and the correcting lever 34 are disposed at a lower position in the timepiece than they occupy in a conventional timepiece, the timepiece being thinner in consequence. Moreover, since the positioning plate 16 is disposed above the day correcting lever 34, it prevents the latter from being forced upwardly.

The positioning plate 16 is provided with a bearing 41 on which the minute wheel pinion 35 is mounted.

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The timepiece is provided with a winding stem (not shown) which is capable of being moved axially into three spaced apart positions. When the winding stem is pulled out into its third position, this causes the clutch wheel 36 to be shifted in the direction of the arrow D of Figure 6 so as to cause engagement between crown gear teeth 40 of the clutch wheel 36 and the teeth of the minute wheel 32. If the winding stem is then rotated while in its third position, the clutch wheel 36 is correspondingly rotated with the result that the minute wheel 32 is also rotated. Since however the minute wheel pinion 35 meshes with the gear portion 12, the rotation of the minute wheel 32 also produces rotation of the hour wheel 11 and therefore produces corresponding rotation of an hour hand (not shown) so as to enable the position of the hour hand to be adjusted. Since at this stage the clutch wheel 36 is in direct engagement with the minute wheel 32, it is not necessary to provide a setting wheel between the crown gear teeth 40 and the minute wheel 32. Consequently, the distance S (Figure 5) between the cam plate 39 and the minute wheel pinion 35 is longer than in a conventional timepiece. As a result, the correcting lever 34 can be disposed in the space between the minute wheel 32 and the positioning plate 16, such utilization of this space enabling the thickness of the timepiece to be reduced.

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In the embodiment shown in the drawings the positioning plate 16 is shown as being secured to the base plate 22, but it can if desired be secured to another fixed part of the timepiece.

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Since the lower surface of the positioning plate 16 is disposed substantially at the same level as the upper surface of the gear portion 12, not only the day star wheel 14, but also

the day calendar dial 19 and the correcting lever 34 are disposed closer to the base plate 22 than in a conventional timepiece. As a result, the thickness of the timepiece is reduced.

WHAT WE CLAIM IS:-

1. A calendar mechanism for a timepiece comprising an hour wheel having a cylindrical portion and a gear portion, a day star wheel rotatably mounted on the said cylindrical portion, the maximum diameter of the day star wheel being less than that of the said gear portion, and a positioning plate which overlaps the said gear portion to limit axial movement of the latter in a predetermined direction, the positioning plate extending around at least a part of the day star wheel. 75
2. A calendar mechanism as claimed in Claim 1 in which the positioning plate is fixed to a base plate by at least one connector means, the width of the positioning plate being reduced in at least one region to enable the positioning plate to bend within its own plane in response to strain introduced by said connector means. 80 85
3. A calendar mechanism as claimed in Claim 2 in which the or each connector means comprises a screw having a head disposed wholly within a hole in the positioning plate. 90 95
4. A calendar mechanism as claimed in any preceding claim in which the positioning plate has a peripheral portion which overlaps a part of a date wheel to limit axial movement of the latter in the said predetermined direction. 100 105
5. A calendar mechanism as claimed in Claim 4 in which the said part of the date wheel is connected by a curved portion to a step portion of the date wheel, the step portion being disposed adjacent to the said peripheral portion of the positioning plate, the said peripheral portion having chamfered parts which are spaced from the said curved portion. 110 115
6. A calendar mechanism as claimed in any preceding claim in which the positioning plate has depressions therein to strengthen the positioning plate. 120
7. A calendar mechanism as claimed in any preceding claim in which there is provided a day correcting lever for correcting the day star wheel, the day correcting lever being disposed between the positioning plate and a minute wheel. 125

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representing Monday.

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In a conventional timepiece, both the day star wheel and the day correcting lever are disposed above the positioning plate. In the embodiment shown in the drawings, however, the correcting lever 34 is disposed in the space between the positioning plate 16 and the minute wheel 32 thus helping to reduce the thickness of the timepiece as much as possible.

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The positioning plate 16 is provided with a bearing 41 on which the minute wheel pinion 35 is mounted.

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The timepiece is provided with a winding stem (not shown) which is capable of being moved axially into three spaced apart positions. When the winding stem is pulled out into its third position, this causes the clutch wheel 36 to be shifted in the direction of the arrow D of Figure 6 so as to cause engagement between crown gear teeth 40 of the clutch wheel 36 and the teeth of the minute wheel 32. If the winding stem is then rotated while in its third position, the clutch wheel 36 is correspondingly rotated with the result that the minute wheel 32 is also rotated. Since however the minute wheel pinion 35 meshes with the gear portion 12, the rotation of the minute wheel 32 also produces rotation of the hour wheel 11 and therefore produces corresponding rotation of an hour hand (not shown) so as to enable the position of the hour hand to be adjusted. Since at this stage the clutch wheel 36 is in direct engagement with the minute wheel 32, it is not necessary to provide a setting wheel between the crown gear teeth 40 and the minute wheel 32. Consequently, the distance S (Figure 5) between the cam plate 39 and the minute wheel pinion 35 is longer than in a conventional timepiece. As a result, the correcting lever 34 can be disposed in the space between the minute wheel 32 and the positioning plate 16, such utilization of this space enabling the thickness of the timepiece to be reduced.

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WHAT WE CLAIM IS:-

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1. A calendar mechanism for a timepiece comprising an hour wheel having a cylindrical portion and a gear portion, a day star wheel rotatably mounted on the said cylindrical portion, the maximum diameter of the day star wheel being less than that of the said gear portion, and a positioning plate which overlaps the said gear portion to limit axial movement of the latter in a predetermined direction, the positioning plate extending around at least a part of the day star wheel.

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2. A calendar mechanism as claimed in Claim 1 in which the positioning plate is fixed to a base plate by at least one connector means, the width of the positioning plate being reduced in at least one region to enable the positioning plate to bend within its own plane in response to strain introduced by said connector means.

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3. A calendar mechanism as claimed in Claim 2 in which the or each connector means comprises a screw having a head disposed wholly within a hole in the positioning plate.

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4. A calendar mechanism as claimed in any preceding claim in which the positioning plate has a peripheral portion which overlaps a part of a date wheel to limit axial movement of the latter in the said predetermined direction.

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5. A calendar mechanism as claimed in Claim 4 in which the said part of the date wheel is connected by a curved portion to a step portion of the date wheel, the step portion being disposed adjacent to the said peripheral portion of the positioning plate, the said peripheral portion having chamfered parts which are spaced from the said curved portion.

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6. A calendar mechanism as claimed in any preceding claim in which the positioning plate has depressions therein to strengthen the positioning plate.

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7. A calendar mechanism as claimed in any preceding claim in which there is provided a day correcting lever for correcting the day star wheel, the day correcting lever being disposed between the positioning plate and a minute wheel.



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5 8. A calendar mechanism for a time-
piece substantially as hereinbefore de-
scribed with reference to and as shown in
Figures 2 to 6 of the accompanying draw-
ings.

9. A timepiece provided with a calendar
mechanism as claimed in any preceding
claim.

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