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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS RELATING TO WATCHES

(71) We, KABUSHIKI KAISHA SUWA SEIKOSHA, a Japanese company, of 5—19, 4-chome, Ginza-Nishi, Chuo-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 improvements relating to watches.

Watches are generally provided with a regulating lever for adjusting the rate of the watches, and this lever is only accessible after the case of the watch, or more specifically, the back cover, has been opened. It will therefore be understood that to adjust the rate of the watch is time-consuming since the case has to be opened and re-closed. Moreover, in the case of waterproof watches, the repeated opening and re-closing of the case has a deleterious effect on the "waterproofness" of the watch. Furthermore, the trend in modern watch manufacture is not only to make watch cases waterproof, but also to make these cases as one-piece cases, and this trend clearly increases the inconvenience of having to open and then re-close the watch-case for each adjustment of the rate.

The present invention seeks to eliminate the above drawbacks.

According to the present invention, there is provided a watch including a case, a regulating lever for adjusting the rate of said watch, and an adjusting member which is settable through an aperture in said case and which is drivingly connected with said lever, or with a part connected for movement with said lever, said aperture being provided with sealing means and a removable cover adapted to engage said sealing means so as to render said watch waterproof, and said member being aligned with said aperture, whereby the rate of said watch may be adjusted upon removal of said cover by setting said member

without removal of said case, or any part thereof other than said cover. 45

In one preferred embodiment, said member and said lever are both rotatable and are drivingly connected *via* a regulator shaft having gear teeth at one end thereof and meshing with said member at the other end thereof, and a regulator wheel meshing with said gear teeth. 50

Said lever may have a bifurcated end defining a gap therein, the gap being adapted to receive a drive transmitting means rigidly mounted on said part connected for movement, said part being a regulator wheel. 55

The said drive transmitting means may be a disc which is coaxial with said regulator wheel and which has a radial projection for engagement in said gap. Alternatively, said drive transmitting means may be an integral pin projecting from the periphery of said regulator wheel which is adapted to engage in said gap. In yet a further alternative, the said drive transmitting means may be a cam mounted eccentrically on said wheel for engagement in said gap. 60 65

In another preferred embodiment, said lever has preferably a sector-shaped end provided with gear teeth for said meshing engagement with said regulator wheel, or with a gear wheel mounted rigidly and coaxially with said regulator wheel. The teeth of the regulator shaft may be in the form of a crown gear. Alternatively, said regulator shaft may be a worm shaft. 70 75

In yet another preferred embodiment, said shaft is in the form of an externally threaded screw to effect said threaded engagement with the internal threads of a sliding body, said body being adapted to slide in a groove in the plate of the watch and being provided with means for engaging with said lever. 80

Said body may be provided with a projecting pin for engaging a cam slot in the regulating lever, or in an intermediate mem- 85

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ber which itself may be provided with a projection for engagement in a gap defined by a bifurcated end in said regulating lever.

The invention will now be described, merely by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic plan view of part of a watch in accordance with one embodiment of the present invention;

Figure 2 is a sectional view of the watch shown in Figure 1;

Figure 3 is a perspective view of the regulating shaft shown in Figures 1 and 2;

Figure 4 is a view similar to Figure 1, but showing a second embodiment of the invention;

Figure 5 is a view similar to Figure 1, but showing a further embodiment of the present invention;

Figure 6 is a view similar to Figure 1, but showing a fourth embodiment of the present invention;

Figure 7 is a view similar to Figure 1, but showing a fifth embodiment of the present invention;

Figure 8 is a cross-section of the watch shown in Figure 7;

Figure 9 is a view similar to Figure 1, but showing a sixth embodiment of a watch according to the present invention;

Figure 10 is a cross-section of the parts shown in Figure 9;

Figure 11 is a perspective view of the sliding body shown in Figure 9 and 10;

Figure 12 is a perspective view of a modification of the sliding body shown in Figure 11; and

Figure 13 is a plan view similar to Figure 1, but showing a seventh embodiment of the present invention.

In the description below, similar parts have been allotted similar reference numerals.

Referring first to the embodiment shown in Figures 1 to 3, there is shown a watch having a watch case 7 and a rate regulating lever 1. The rate regulating lever 1 is provided with bifurcated ends 8, defining a gap therebetween. A projection 2a integral with a disc-shaped drive transmitting member 2 engages in the gap between bifurcated ends 8. The member or disc 2 is mounted coaxially above and for rotation with the regulating gear wheel 3 which is in mesh with the gear teeth 4 of a regulating shaft 5, (see Figure 3). As can be seen, the gear teeth 4 are in the form of a crown gear.

The regulator shaft 5 extends radially outwardly and terminates at its end opposite of the gear wheel 3 in a screw-head.

The screw-head of the shaft 5 may be engaged by, e.g. a screw-driver. Rotation thereof, by virtue of the mesh between the gear teeth 4 and the regulating wheel 3, will be transmitted to the disc 2 and the projection 2a to cause angular displacement of the re-

gulating lever 1, thereby adjusting the rate of the watch. In order to protect the rate adjustment mechanism from inadvertent actuation, the radially outer end of the regulating shaft 5 is radially inwardly of the aperture in the watch case 7, and radially aligned therewith. A substantially screw-shaped cover member 14 is readily removably mounted in the aperture of the watch case and a sealing ring 26 is provided to provide a seal between the cover member 14 and the watch case 7 to preserve the waterproofness of the watch. It will therefore be appreciated that the regulator shaft 5 is protected from inadvertent rotation, since in order to adjust the rate of the watch, the cover 14 must first be removed. Thus, according to this embodiment, the rate of the watch may be adjusted without having to open and re-close the watch case 7.

Referring now to the embodiment shown in Figure 4, there is shown a modification of the embodiment of Figures 1 to 3 in that the regulating lever 1 is more elongated and its bifurcated ends 8 are engaged by a pin 9 fixed on the regulating wheel 3 and mounted on the periphery thereof. The operation of this embodiment is, of course, similar to that of the embodiment of Figures 1 to 3, the drive from the regulator shaft 5 being transmitted to the lever 1 by way of the projection 9.

Referring now to Figure 5, there is shown a further modification of the foregoing embodiments, in which the regulating lever 1 is again provided with a fork-shaped end 10 but with a much larger gap between the two limbs of the end 10. In this case, a cam 11 mounted eccentrically on the regulating wheel 3 transmits the drive in operation from the regulating shaft 5 to lever 1.

Referring now to Figure 6, in a further modification the lever 1 is substantially sector-shaped and is provided with gear teeth 12 at its radially outer end, which teeth 12 are arranged to be in mesh with a gear wheel 15 mounted coaxially above the gear wheel 3 for rotation therewith. The mode of operation of this embodiment is similar to that of the preceding embodiments and will not, therefore, be described.

Referring now to the embodiment shown in Figures 7 and 8, the construction is substantially similar to that of the embodiment of Figures 1 to 3, except that the regulator shaft 5 with its crown gear 4 is replaced by a worm shaft 16 having a worm gear 17 meshing with the teeth of the regulator wheel 3. Otherwise, the mode of operation of the watch according to this embodiment is the same as that of the foregoing embodiment, and it will be clear that rotation of the worm shaft 16 will cause drive to be transmitted via the worm gear 17, regulator wheel 3, disc 2 and projection 2a, to the lever 1.

Referring to the embodiment shown in Figures 9 to 11, the cover member 14 is once again mounted in an aperture in the watch case 7 and engages with sealing ring

26. Radially inwardly of the cover member 14 is the head of a screw 20 provided with a collar. The collar is in sliding engagement with the walls of a groove 21. Mounted for sliding movement in the groove 21 is a cylindrical body 18 having a central integral bore therethrough, the threads of the body 18 mating with the threads of the screw 20. The body 18 is integral with an upstanding pin 19 which extends through a cam slot 23 in a drive transmitting member or lever 22 having at one end a projection 22a engaging in the gap between the bifurcated ends 8 of the regulating lever 1. The lever 22 is pivoted by means of a screw at 24.

It will be appreciated that upon rotation of the screw 20, by virtue of the screw threaded engagement between the screw 20 and the body 18, the latter will slide axially in said groove as it advances, and so will the projecting pin 19. The engagement between the pin 19 and the cam slot 23 in the lever 22 will cause the latter to rotate about its pivot 24 and thus angularly to displace the lever 1 to adjust the rate of the watch.

Figure 12 shows a modification of the sliding body 18 shown in Figure 11, in which the body 18 is provided with a central groove 19a extending transversely of the screw threaded bore and located in the upper surface thereof, the groove 19a being engageable either with a downward projection on the lever 22 (not shown) or even, by suitable extension of the length of the lever 1, with the bifurcated end 8 thereof. In fact, the bifurcated end 8 may be in sliding engagement in the groove 19a.

A direct engagement between the regulating lever 1 and the projecting pin 19 is shown in the embodiment of Figure 13, now referred to. The construction is substantially similar in most respects to the embodiment shown in Figures 9 to 11, but the upwardly projecting pin 10 engages in a cam slot 27 formed in an extension of the regulating lever 1 itself, without making use of an intermediate member such as the lever 22 of Figure 9.

In all the above described embodiments, the regulating lever 1 is a one-piece member, but in fact it could be made as a two-piece member and then adjustment of the shaft 5 may be used for effecting a micro adjustment only.

Various small modifications of the above described embodiments are envisaged within the scope of the present invention. The shape of the gear teeth 4 of the regulating shaft 5 may be made triangular, if so desired. Evidently, the worm drive arrangement of

the embodiment of Figures 7 and 8 could take the place of the regulating shaft 5 with its ground gear 4 of the embodiments of Figures 1 to 6 and vice versa.

If micro adjustment only is desired, the embodiments of Figures 7 to 13 are particularly suitable.

It will be appreciated that the illustrated embodiments of the present invention are particularly advantageous in the case of a waterproof watch, in that by allowing rate adjustment to be carried out from externally of the watch, in the sense that the watch case 7 need not be opened and then re-closed, the "waterproofness" of the watch will not deteriorate on repeated adjustment of the rate. The constructions, according to the illustrated embodiments of this invention are, moreover, particularly suitable for one-piece watch cases, i.e. where the back cover is not separated from the rest of the case body and in which usually the movement has to be taken out from the dial side. The sealing arrangement preserves the dustproofness and waterproofness of the watch.

Reference is directed to our copending parent Application No. 33891/68 (Serial No. No. 1231615).

WHAT WE CLAIM IS:—

1. A watch including a case, a regulating lever for adjusting the rate of said watch, an adjusting member which is settable through an aperture in said case and which is drivingly connected with said lever or with a part connected for movement with said lever, said aperture being provided with sealing means and a removable cover adapted to engage said sealing means so as to render said case waterproof, and said adjusting member being aligned with said aperture, whereby the rate of said watch may be adjusted upon removal of said cover by setting said member without removal of said case, or any part thereof other than said cover.

2. A watch as claimed in any preceding claim wherein said member and said lever are both rotatable and are drivingly connected via a regulator wheel, said member having gear teeth at one end thereof and said regulator wheel meshing with said gear teeth.

3. A watch as claimed in claim 2 wherein said lever has a bifurcated end defining a gap therein, the gap being adapted to receive a drive transmitting means rigidly mounted on said regulator wheel.

4. A watch as claimed in claim 3 wherein said drive transmitting means is a disc which is coaxial with said regulator wheel and which has a radial projection for engagement in said gap.

5. A watch as claimed in claim 3 wherein said drive transmitting means is an integral pin projecting from the periphery of said

Referring to the embodiment shown in Figures 9 to 11, the cover member 14 is once again mounted in an aperture in the watch case 7 and engages with sealing ring 26. Radially inwardly of the cover member 14 is the head of a screw 20 provided with a collar. The collar is in sliding engagement with the walls of a groove 21. Mounted for sliding movement in the groove 21 is a cylindrical body 18 having a central integral bore therethrough, the threads of the body 18 mating with the threads of the screw 20. The body 18 is integral with an upstanding pin 19 which extends through a cam slot 23 in a drive transmitting member or lever 22 having at one end a projection 22a engaging in the gap between the bifurcated ends 8 of the regulating lever 1. The lever 22 is pivoted by means of a screw at 24.

It will be appreciated that upon rotation of the screw 20, by virtue of the screw threaded engagement between the screw 20 and the body 18, the latter will slide axially in said groove as it advances, and so will the projecting pin 19. The engagement between the pin 19 and the cam slot 23 in the lever 22 will cause the latter to rotate about its pivot 24 and thus angularly to displace the lever 1 to adjust the rate of the watch.

Figure 12 shows a modification of the sliding body 18 shown in Figure 11, in which the body 18 is provided with a central groove 19a extending transversely of the screw threaded bore and located in the upper surface thereof, the groove 19a being engageable either with a downward projection on the lever 22 (not shown) or even, by suitable extension of the length of the lever 1, with the bifurcated end 8 thereof. In fact, the bifurcated end 8 may be in sliding engagement in the groove 19a.

A direct engagement between the regulating lever 1 and the projecting pin 19 is shown in the embodiment of Figure 13, now referred to. The construction is substantially similar in most respects to the embodiment shown in Figures 9 to 11, but the upwardly projecting pin 10 engages in a cam slot 27 formed in an extension of the regulating lever 1 itself, without making use of an intermediate member such as the lever 22 of Figure 9.

In all the above described embodiments, the regulating lever 1 is a one-piece member, but in fact it could be made as a two-piece member and then adjustment of the shaft 5 may be used for effecting a micro adjustment only.

Various small modifications of the above described embodiments are envisaged within the scope of the present invention. The shape of the gear teeth 4 of the regulating shaft 5 may be made triangular, if so desired. Evidently, the worm drive arrangement of

the embodiment of Figures 7 and 8 could take the place of the regulating shaft 5 with its ground gear 4 of the embodiments of Figures 1 to 6 and vice versa.

If micro adjustment only is desired, the embodiments of Figures 7 to 13 are particularly suitable.

It will be appreciated that the illustrated embodiments of the present invention are particularly advantageous in the case of a waterproof watch, in that by allowing rate adjustment to be carried out from externally of the watch, in the sense that the watch case 7 need not be opened and then re-closed, the "waterproofness" of the watch will not deteriorate on repeated adjustment of the rate. The constructions according to the illustrated embodiments of this invention are, moreover, particularly suitable for one-piece watch cases, i.e. where the back cover is not separated from the rest of the case body and in which usually the movement has to be taken out from the dial side. The sealing arrangement preserves the dustproofness and waterproofness of the watch.

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WHAT WE CLAIM IS:—

1. A watch including a case, a regulating lever for adjusting the rate of said watch, an adjusting member which is settable through an aperture in said case and which is drivingly connected with said lever or with a part connected for movement with said lever, said aperture being provided with sealing means and a removable cover adapted to engage said sealing means so as to render said case waterproof, and said adjusting member being aligned with said aperture, whereby the rate of said watch may be adjusted upon removal of said cover by setting said member without removal of said case, or any part thereof other than said cover.
2. A watch as claimed in any preceding claim wherein said member and said lever are both rotatable and are drivingly connected via a regulator wheel, said member having gear teeth at one end thereof and said regulator wheel meshing with said gear teeth.
3. A watch as claimed in claim 2 wherein said lever has a bifurcated end defining a gap therein, the gap being adapted to receive a drive transmitting means rigidly mounted on said regulator wheel.
4. A watch as claimed in claim 3 wherein said drive transmitting means is a disc which is coaxial with said regulator wheel and which has a radial projection for engagement in said gap.
5. A watch as claimed in claim 3 wherein said drive transmitting means is an integral pin projecting from the periphery of said



regulator wheel which is adapted to engage in said gap.

- 5 6. A watch as claimed in claim 3 wherein said drive transmitting means is a cam mounted eccentrically on said wheel for engagement in said gap.

- 10 7. A watch as claimed in claim 2 wherein said lever has a sector-shaped end provided with gear teeth for meshing with said regulator wheel, or for meshing with a gear wheel mounted rigidly and coaxially with said regulator wheel.

- 15 8. A watch as claimed in any of claims 2 to 7 wherein said teeth of said member are in the form of a crown gear.

9. A watch as claimed in any of claims 2 to 7 wherein said member is a worm shaft.

- 20 10. A watch as claimed in claim 1 wherein said member and said lever are both rotatable, said member being in the form of an externally threaded screw which is in threaded engage-

ment with the internal threads of a sliding body, said body being adapted to slide in a groove in the plate of the watch and being provided with means for engaging with said lever. 25

11. A watch as claimed in claim 10 wherein said body is provided with a projecting pin for engaging a cam slot in the regulating lever, or in an intermediate member which itself is provided with a projection for engagement in a gap defined by a bifurcated end of said regulating lever. 30

12. A watch substantially as hereinbefore described with reference to and as shown in the accompanying drawings. 35

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