

[54] TIMEPIECE FITTED WITH A REGULATOR CONTROLLABLE FROM OUTSIDE

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[51] Int. Cl. G04b 27/02
[58] Field of Search 58/63-73, 85.5

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[57] ABSTRACT

A watch having a regulator-adjusting mechanism from a winding and time-settable stem operable from outside of the watch movement, the mechanism being provided with specific resisting means against manual pull of the stem to its regulator-adjusting position.

4 Claims, 10 Drawing Figures

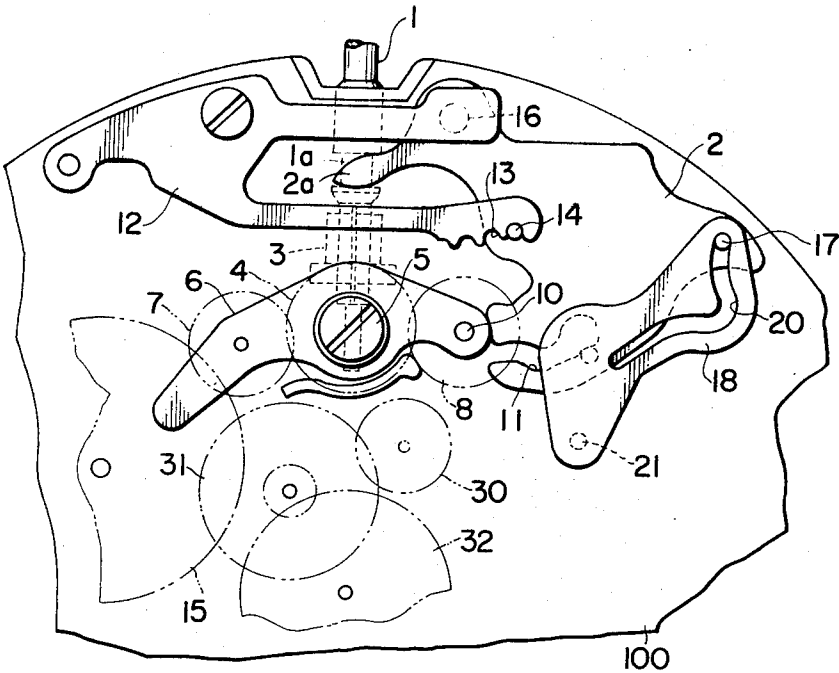


FIG. 1

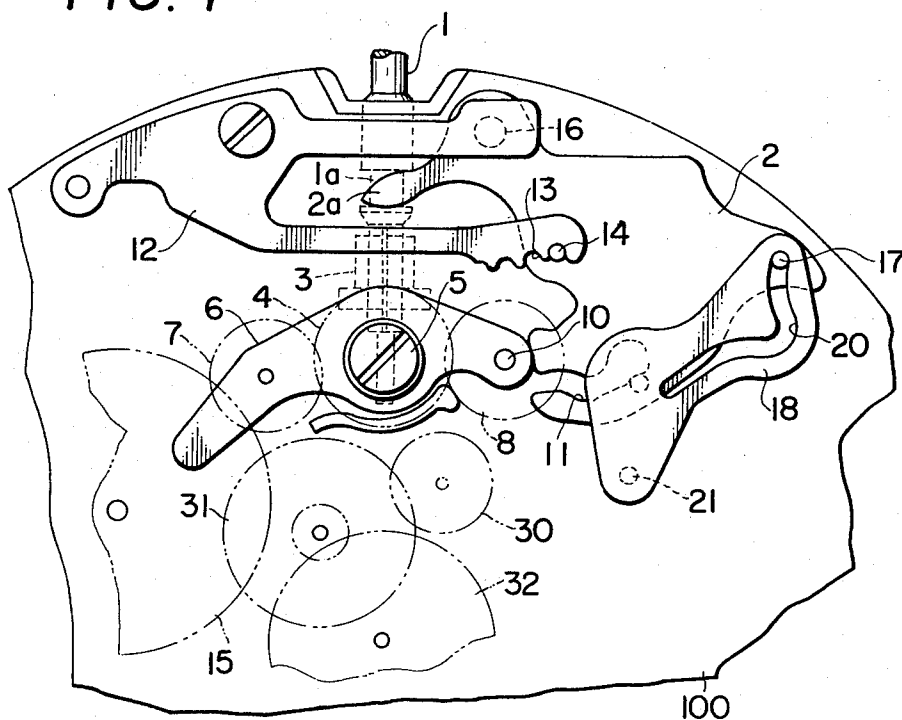


FIG. 2

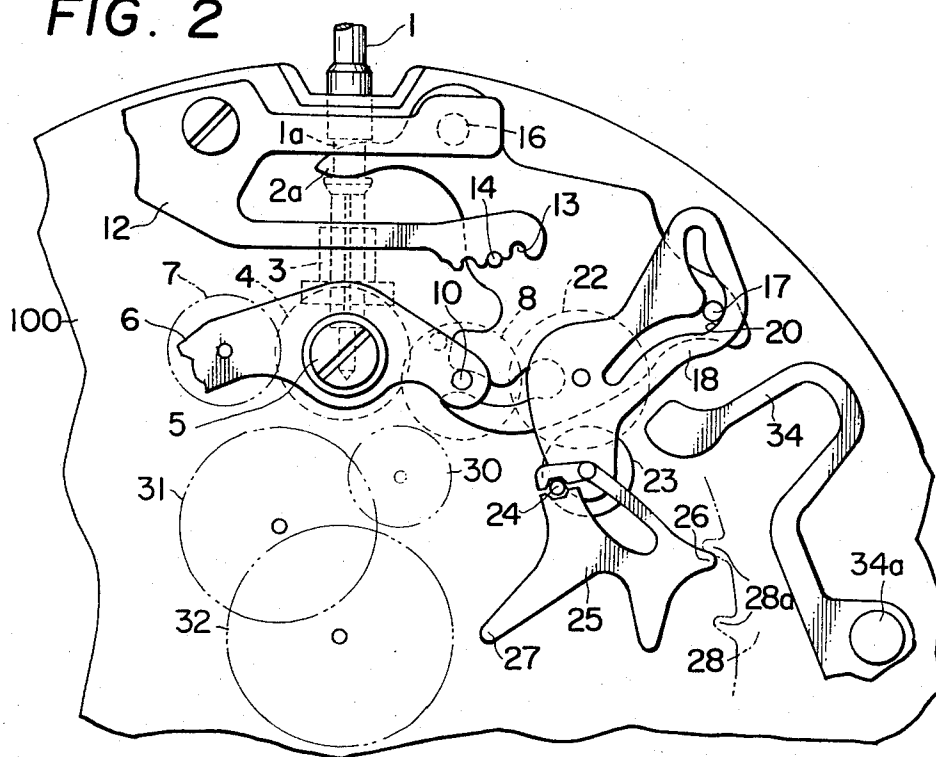


FIG. 3

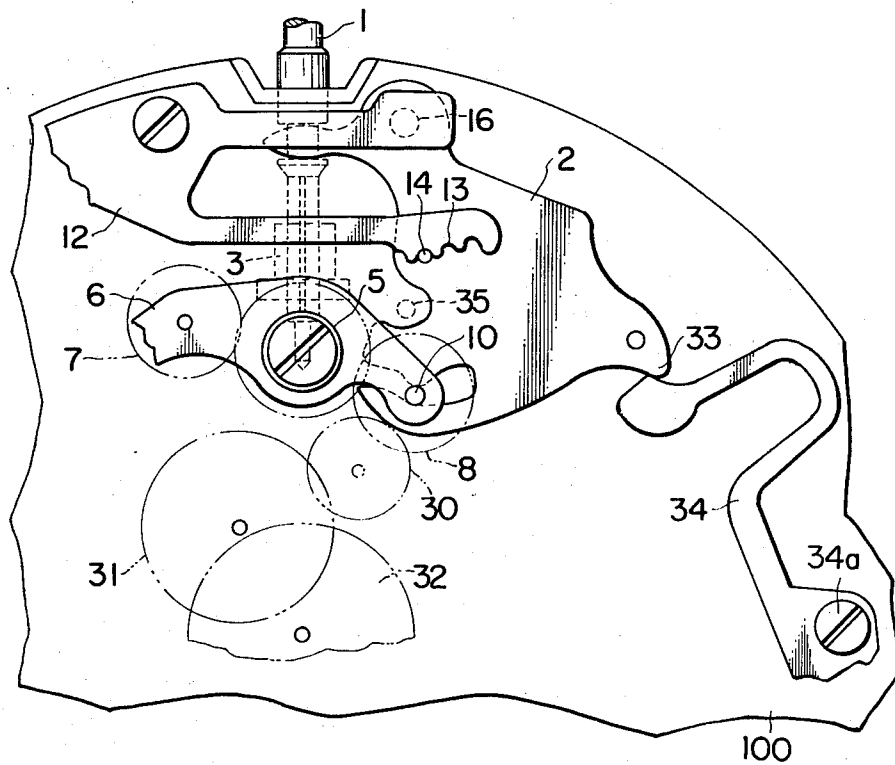


FIG. 4

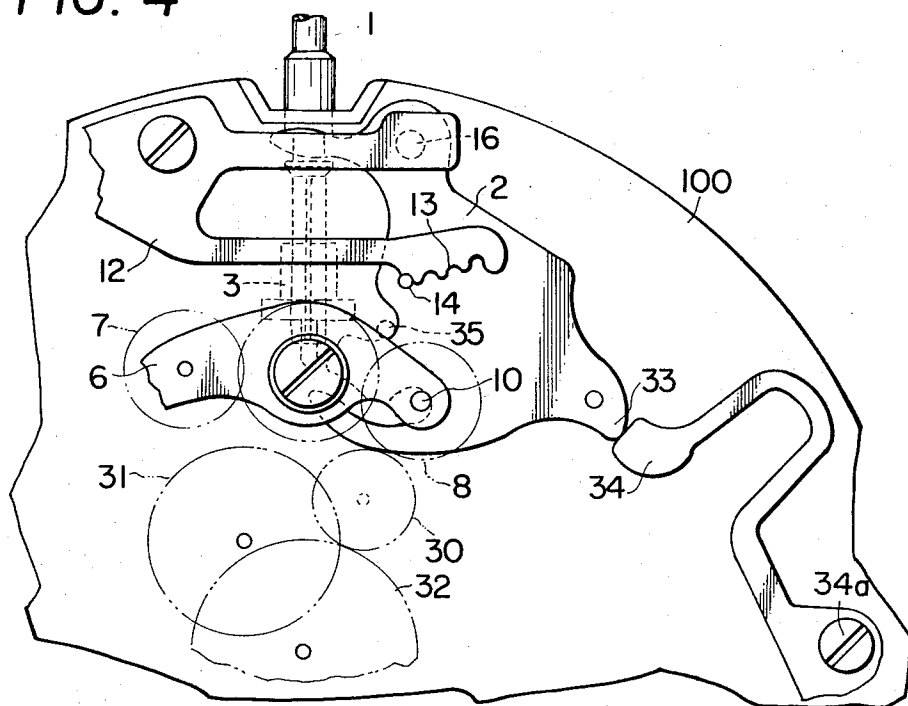


FIG. 5

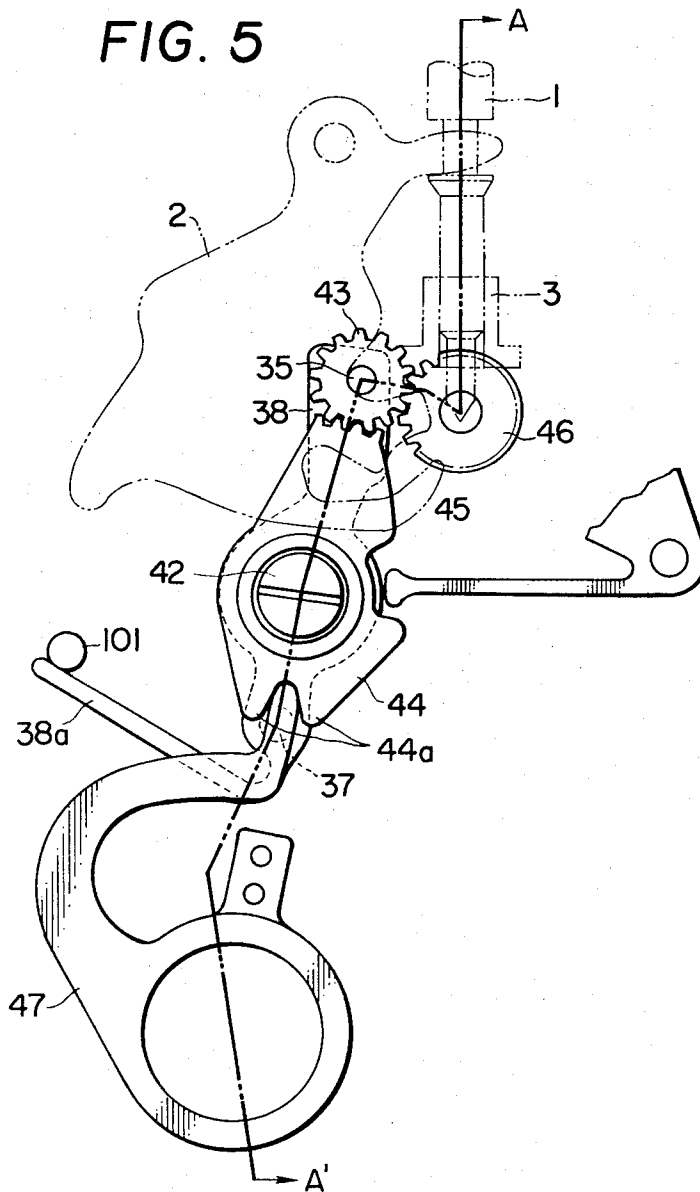


FIG. 6

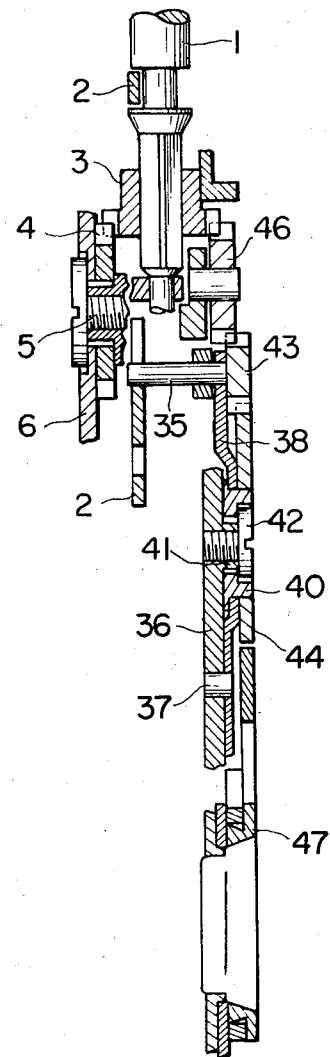


FIG. 7

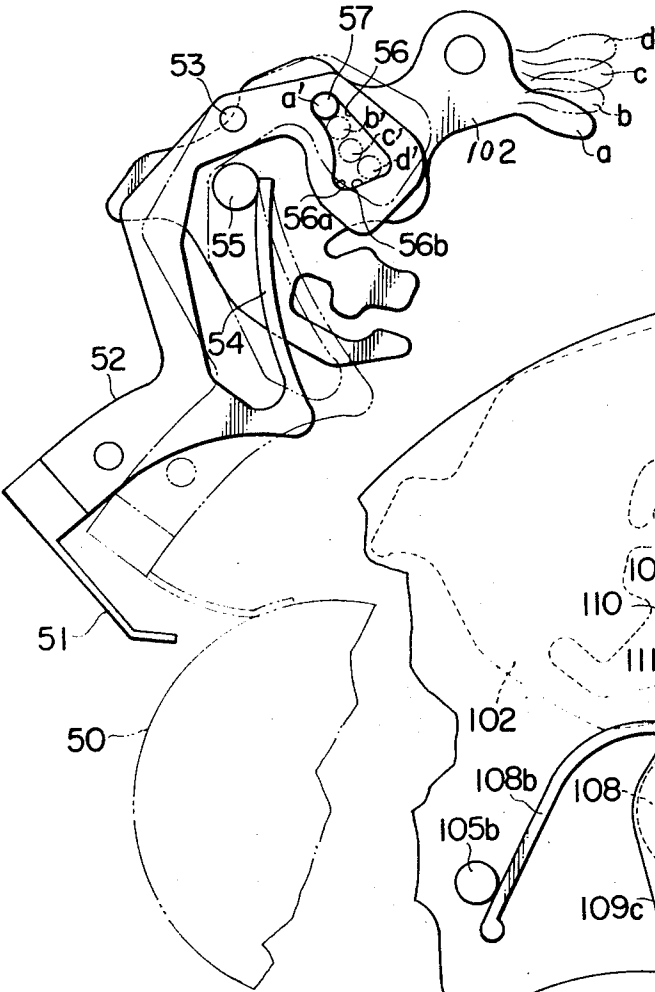


FIG. 8

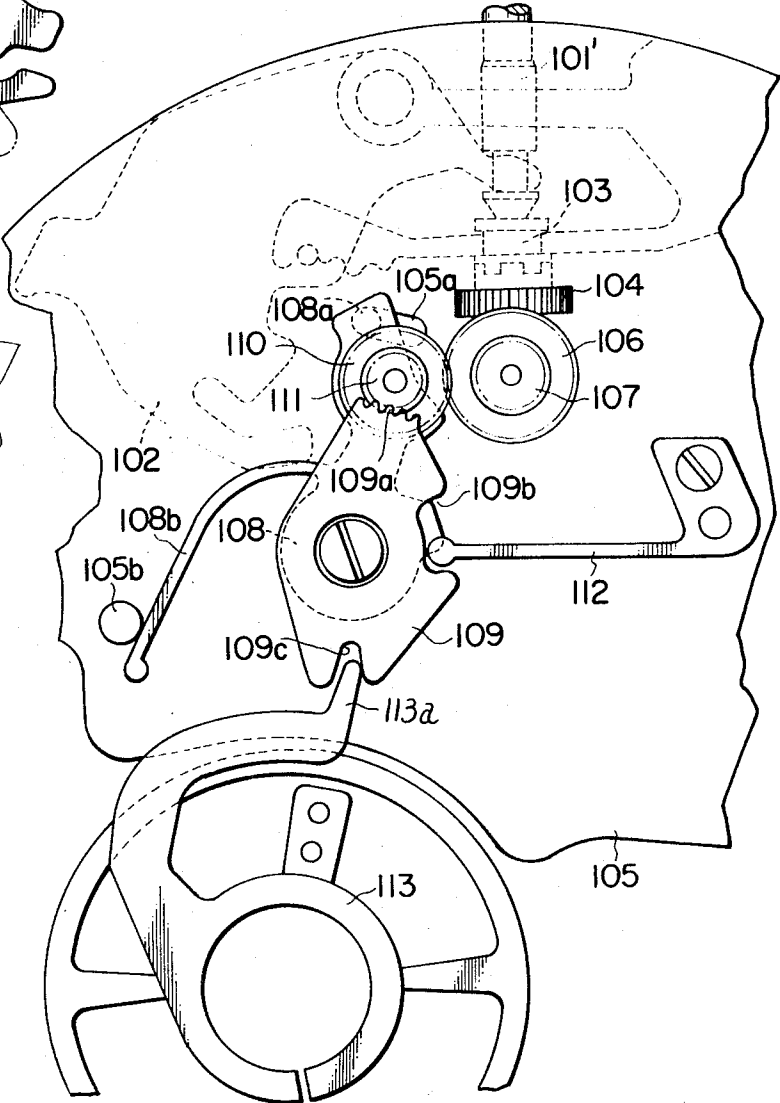


FIG. 9

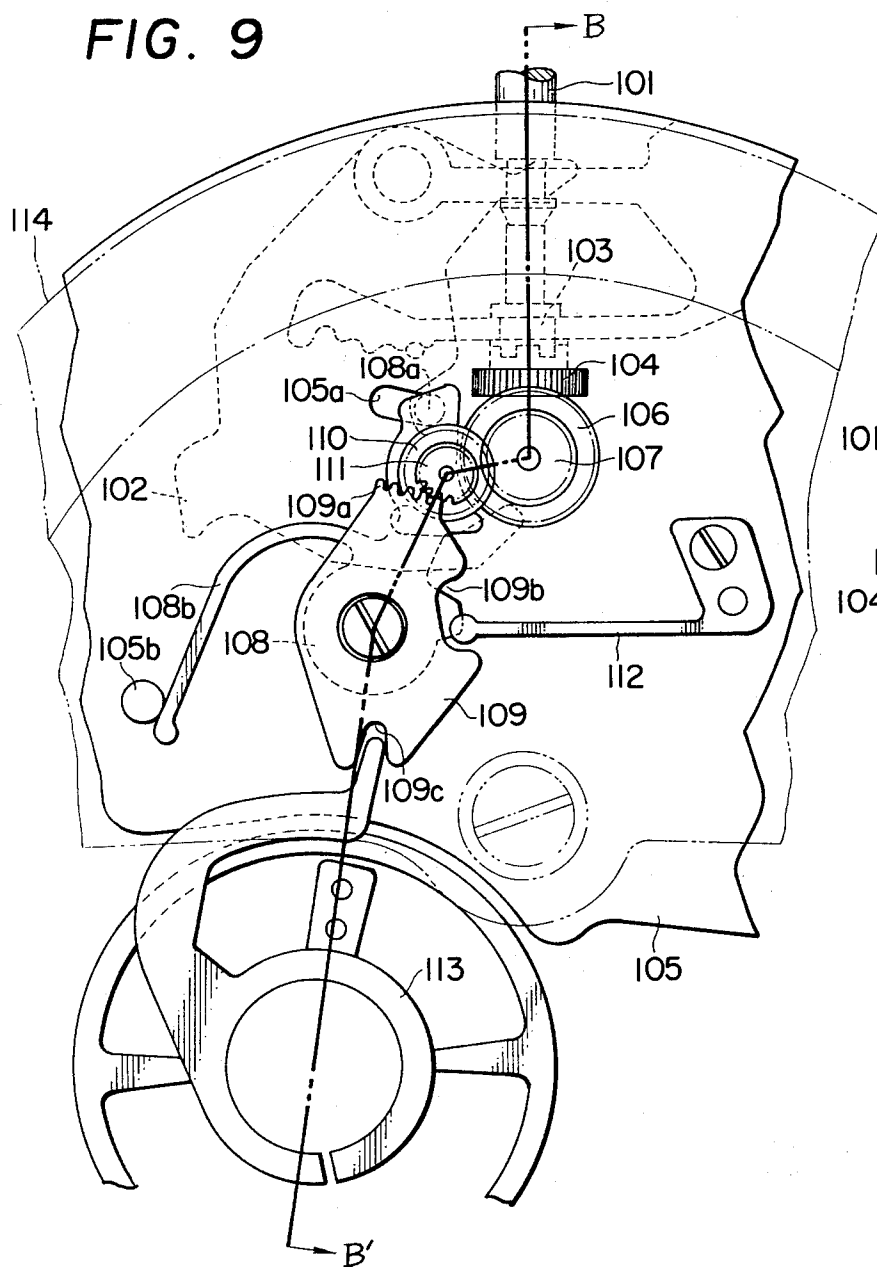
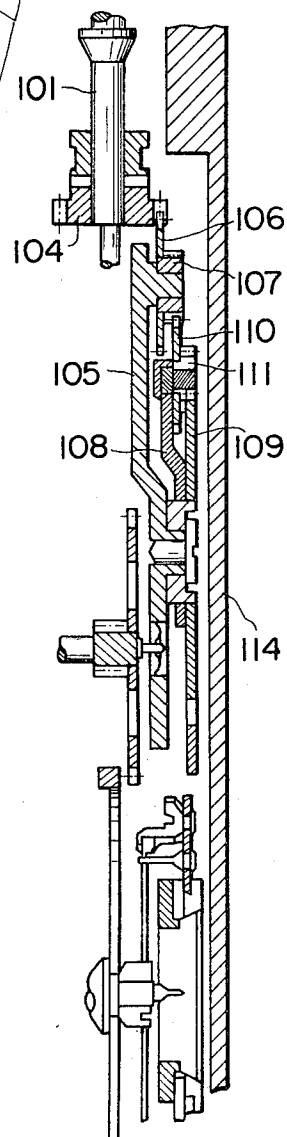


FIG. 10



TIMEPIECE FITTED WITH A REGULATOR CONTROLLABLE FROM OUTSIDE

This invention relates generally to improvements in and relating to operation control mechanism in a watch, by use of a winding stem thereof; it relates more specifically to the mechanism of the above kind and capable of manipulation of the regulator of the watch from outside thereof.

Such watches are known as being fitted with a regulator control mechanism operable from outside thereof. However, a conventional drawback of these known watches is generally such that a knob or the like outside manipulating member serving for the necessary service is exposed to outside, thus representing an unfavorable design feature and providing mostly an insufficient water-proofness.

Correction of the stepping speed of a watch can easily be carried out in a simple manner by manipulation of the regulator provided in the watch, upon opening the back cover thereof.

Recently, however, the watch is designed into a water-proof one having a specially designed watch case adapted for this purpose wherein it is rather difficult for every user of the watch to open the back cover for execution of the regulator manipulation. In the case of the one piece watch case comprising the middle or case band and the back cover united rigidly together, it is still further difficult to manipulate the regulator.

Various mechanisms have been also devised by which the regulator of the watch can be manipulated from outside thereof. Commercialization of these mechanisms has been substantially prevented from its realization on account of various drawbacks inherent therein, such as disturbance to thin type watch design; non-smart appearance and defective water-proofness caused by the provision of a specifically provided stem-like manipulating member projecting from inside of the watch case to outside thereof.

On the other hand, it is highly desirable for the watch movement to interrupt the stepping operation thereof during time-setting manipulation and to let it go during regulating manipulation.

When the watch movement is so designed that the winding stem can serve as the regulator manipulating member and in such a way that the stem is pulled out to its certain predetermined axial position and turned in one or other direction for the manipulation of the regulator, it is highly desirable to impose a rather heavier resistance to the pulling action under consideration other than similar manipulation of the stem for time-setting, winding or calendar-correcting service, and indeed, for the purpose of avoiding maladjustment of the regulator.

It is, therefore, a main object of the present invention to provide a regulator control mechanism under utilization of the time-setting stem to which, however, a heavier resistance is imposed in case of pull-out thereof to its regulator-adjusting position.

It is a further and auxiliary object to provide a regulator control mechanism of the above kind which is highly adapted for provision to the thin type watch movement.

It is a still further object of the present invention to provide a regulator control mechanism of the above kind which can operate so that the stepping motion of

the watch movement may allowed to continue when the regulator is being adjusted.

These and further objects, features and advantages of the invention will become more apparent when read the following detailed description of the invention by reference to the accompanying drawings, in which:

FIGS. 1 - 6 show a first embodiment of the invention.

FIGS. 1 - 4 are schematic plan view of part of the mechanism according to this invention, showing the relative position of main working parts of the mechanism, when the winding stem are positioned at its four different axial positions.

FIG. 5 is a plan view of the mechanism including the regulator, when seen from the rear side of the drawing paper of FIG. 1.

FIG. 6 is a sectional drawing taken substantially along the section line A - A' shown in FIG. 5.

FIGS. 7 - 10 are illustrative of a preferred second embodiment of the invention.

FIG. 7 is an explanatory and schematic plan view of several preferred members of the mechanism for the illustration of the operation thereof.

FIGS. 8 and 9 are schematic plan views of the mechanism according to this invention illustrative of two different stages of the operation thereof; and

FIG. 10 is a section taken substantially along the section line B - B' shown in FIG. 9.

Referring now to FIG. 1, numeral 1 represents a conventional winding stem which is turnably and axially slidably mounted on a pillar plate 100, only partially shown, of a watch movement, not specifically shown. Numeral 2 represents a conventional setting lever which has a tip end 2a kept in cooperative engagement with a ring groove 1a.

Numeral 3 represents a conventional winding pinion which is slidably mounted on the stem 1 for unitary rotation therewith and is kept in meshing with a first setting wheel 4 rotatably mounted on a shaft 5 studded on the plate 100. A change-over lever 6 is rotatably and coaxially mounted on the same shaft 5. Changeover gears 7 and 8 are rotatably mounted on the lever 6 and adapted for engagement with the setting wheel 4.

Setting lever 2 is formed with a cam groove 11 which is adapted for engagement with a pin 10 studded on the lever 6. The lever 2 is further provided with a pin 14 which is adapted for engagement with any one of at least four separations 13 formed on a conventional setting lever spring 12. In this way, the stem 1 can be set selectively at any one of four axial positions, as will become more apparent as the description proceeds. With successive axial drawing-out of the stem 1 from the position shown in FIG. 1, the pin 10 will invade into and successively advance along the cam groove 11, thereby the lever 6 being rotated correspondingly and partially.

In the position shown in FIG. 1, change-over gear 7 is kept in engagement with a conventional winding wheel 15 only partially and schematically shown. By turning the stem 1 under these conditions, motion will be transmitted therefrom through pinion 4 and gear 7 to the wheel 15, so as to wind the power spring, not shown.

When the stem 1 is axially pulled out one step from the position shown in FIG. 1 to that illustrated in FIG. 2, setting lever 2 is rotated in clockwise direction about its pivot pin 16 studded on the pillar plate 100, thereby cam groove 11 being brought into engagement with pin 10. In this way, the change-over lever 6 is partially ro-

tated clockwise around its pivot shaft 5. As seen, a pin 17 studded on setting lever 2 is kept in engagement with a groove 20 on a correction-transmitting lever 18. With the clockwise rotation of setting lever 2, said pin 17 will act upon the lever 18, so as to rotate it counter clockwise about its pivot pin 21 studded on the pillar plate 100, thereby a gear 22 rotatably mounted on the lever being brought into engagement with gear 8. By turning the stem 1 in calendar quick-correcting direction under the operating position of the mechanism shown in FIG. 2, motion will be transmitted therefrom through pinion 4, gears 8 and 22 to a further gear 23 kept in meshing therewith. Motion will be further transmitted from the last-mentioned gear 23 through a transmission pin 24 studded fixedly thereon to a correction lever 25 which is rotatably mounted on the pillar plate 100, although the mounting means have been omitted from the drawing for simplicity thereof. The correction lever 25 has projections 26; 27, adapted for cooperation with drive teeth 28a on a conventional date calendar dial 28, as well as a correction star wheel, not shown, cooperating with a conventional day calendar dial, not shown. By the aforementioned operation, the correction lever 25 performs a circular movement by which the date-and day calendar dials are subjected to a quick calendar correction, respectively.

When the stem 1 is pulled out by a further step, the related members are brought to the position shown in FIG. 3. By turning the stem 1, the correction-transmitting lever 18 is partially rotated clockwise by the pin 17 on the setting lever 2, thereby the gear 22 being caused to disengage from gear 8 and the lever 6 being further rotated clockwise, until the gear 8 is brought into engagement with a setting transmission gear 30. Thus, by rotating the stem 1, the gear 30 is rotated and motion will be transmitted therefrom to conventional minute wheel 31 and cannon wheel 32 arranged to cooperate with said wheel as conventionally. In this way, the watch hands, not shown, can be adjusted as desired.

In the position shown in FIG. 3, a projection 33 formed on setting lever 2 is kept in pressure contact with the tip end of an elongated arm spring 34, the root end thereof being fixedly mounted at 34a on the pillar plate 100. On the other hand, the side edge of setting lever 2 is kept in contact with a pin 35 on a lever 38.

When the stem 1 is pulled out axially from the position shown in FIG. 3 to that shown in FIG. 4, pin 35 is urged to move leftwards in FIG. 3 and the lever 6 is partially rotated counter clockwise, so as to disengage the gear 8 from contact with gear 30.

Referring now to FIGS. 5 and 6, pin 35 is fixedly mounted on the lever 38 which is rotatably mounted by means of a pin 37 on a mounting plate 36. The lever 38 has a set 40 by which the lever is loosely mounted on a projection 41 of the plate 36 and the relative position is fixed by means of a fixing screw 42, as may be clearly seen from FIG. 5.

A gear 43 is rotatably mounted on the pin 35, and gear teeth 45 formed on a lever 44 rotatably mounted on the said seat 40 are kept in meshing with those on gear 43. Lever 38 is formed with a tail spring arm 38a which abuts against a stationary pin 101 mounted on the pillar plate 100, although not shown.

By the movement of pin 35 under the influence of the setting lever 2, the lever 38 will be partially rotated clockwise in FIG. 5 about pin 37 and against the action

of tail spring 38a and the gear 43 is brought into cooperative engagement with a second setting wheel 46 rotatably mounted on the pillar plate 100 although not shown.

Thus, by turning the stem 1 under these operating conditions, motion will be transmitted therefrom through winding pinion 3, second setting wheel 46 and gear 43 to lever 44 which is thus caused to rotate.

Numerical 47 represents a conventional regulator having a tip end which is kept in cooperative engagement with the forked end at 44a of the lever 44. Thus, by the turning movement of the lever 44, the regulator 47 is adjusted correspondingly. In this way, the regulator can be adjusted by turning the stem 1 positioned axially at its fourth operating position shown in FIG. 4.

Next, referring to FIGS. 7 - 10, the second embodiment will be described in detail.

In FIGS. 8 and 9, 101' represents a conventional winding stem; 102 a setting lever; 103 a setting lever spring and 104 a winding pinion. These parts are arranged mutually substantially in the similar manner as before. The pillar plate has been omitted from the drawing for simplicity thereof.

A barrel bridge 105 is fixedly mounted on the front or opposite surface of the pillar plate, while the setting lever 102 is mounted on the rear surface of the pillar plate.

On the barrel bridge 105, a gear 106 is rotatably mounted, said gear being kept in cooperative engagement with winding pinion 104. A further gear 107 is concentrically and unitarily mounted with said gear 106.

On the barrel bridge 105, a change-over lever 108 and a regulator-adjusting member 109 are concentrically and rotatably mounted.

Change-over lever 108 is fixedly attached with a pin 108a passing through a slot 105a of the bridge 105 and a further slot, not shown, formed through the pillar plate, and projecting above the opposite surface thereof where the setting lever 102 is mounted. The lever 108 is formed with a tail spring 108b which abuts resiliently against a stop pin 105b fixedly mounted on the bridge 105. In this way, the lever 108 is subjected to a counter clockwise turning moment. The lever 108 is provided with concentrically arranged unitary gears 110 and 111, as shown.

The member 109 is formed with segmental gear teeth 109a kept in meshing with the gear 111. The member 109 is further formed with recesses 109b and 109c. First recess 109b is kept in cooperative engagement with the tip end of a resilient and elongated spring arm 112 the root portion is fixedly attached to the bridge 105. In the similar way, second recess 109c is kept in cooperative engagement with the resilient tip end 113a of the conventional regulator 113.

In FIG. 8, the constituent parts are positioned in their off-service position in connection with the regulator adjustment. In this case, change-over lever 108 is subjected to a counter clockwise turning moment under the action of tail spring 108b and the pin 108a is kept in pressure engagement with the left end extremity of slot 105a.

When the stem 101' is turned, motion will be transmitted through winding pinion 104, gears 106 and 109. But, no motion can be transmitted to the regulator.

In the position shown in FIG. 9, the stem 101' and the related parts of the mechanism is positioned adapted

for adjustment of the regulator. An automatic winding weight mass is shown additionally in FIG. 9 schematically and only partially with chain-dotted lines at 114. In FIG. 10, the weight mass is shown in its section.

By shifting axially the stem 101' from the position in FIG. 8 to that shown in FIG. 9, the setting lever 102 has been rotated correspondingly clockwise and brought into pressure contact with pin 108a, thereby the change-over lever 108 being rotated clockwise against the action of its tail spring 108b. In this way, gear 107 is brought into meshing engagement with gear 110. During this operational movement, gear 111 does not provide any influence upon the regulator-adjusting member 109.

When the stem 101' is rotated under these conditions, motion will be transmitted therefrom, in a speed-reducing manner, through winding pinion 104; gears 106; 107 and 110 to 111, so as to rotate the adjusting member 109 for adjustment of the regulator 113. If the stem 101' is rotated to an overdue range in one direction, the engagement between the gears 109a and 111 being released. Since, however, the recess 109b is resiliently engaged by resilient member 112, thus the member 109 being subjected to a resilient force towards engagement with gear 109a; 111 will be brought into mutual engagement when the stem 101' is rotated in the reverse direction.

As shown specifically in FIG. 7, a start-stop lever 52 is pivotably mounted at 53 on the pillar plate or barrel bridge, said lever 52 having a tail spring 51 which is adapted for pressure contact with the outer periphery of a conventional balance wheel 50 only schematically and partially shown on account of its very popularity. The lever 52 is formed with a spring arm 54 which is kept in pressure contact with a stop pin 55 rigidly mounted on the pillar plate or barrel bridge, although not shown.

The lever 52 is further formed with a slot 56 which receives a pin 57 studded on the setting lever 102.

The stem 101' can be positioned successively at four different axial positions, as in the similar way in the first embodiment.

In corresponding therewith, the setting lever 102 can occupy four successive positions as shown at a, b, c and d in FIG. 7, respectively. In the similar manner, the pin 57 can take its four different positions shown at a', b', c' and d', respectively.

At the first and second positions of stem 101' at a and b, the lever 52 is not operated by the ineffective engagement between groove 56 and pin 57. In this case, the tail spring 51 is kept in its separated position from the balance wheel 50.

When the stem 101' is positioned at its third axial position, the pin 57 will occupy its third corresponding position shown at c', relative to wall part 56a of the cam groove 56. The lever 52 is rotated counter clockwise under the action of spring arm 54 and brought into pressure and resilient contact by its tail spring 51 with balance wheel 50 which is thus brought into its dead stop position.

When the stem 101' is drawn-out to its fourth axial position adapted for the execution of a regulator adjusting operation, pin 57 will slide along a cam groove wall at 56b, thereby the lever being rotated clockwise and thus the tail spring 51 being receded from contact with the balance wheel 50. Therefore, the watch move-

ment can initiate again its operative movement. This feature can be, when necessary, embodied also in the foregoing first embodiment of the invention.

From the foregoing detailed description of several preferred embodiments of the invention, it is clear that by manipulating the winding stem, adjustment of the regulator can be brought about so that otherwise possible non-smartness in the overall ornamental design of the watch can be avoided and otherwise possible failure of insufficiency of the water-proofness can be counter-measured.

Although specifically shown, the regulator can be provided on the front side gear-train bridge, the regulator-adjusting can be avoided from interference with the complexed mechanical parts of the calendar and its control or correction mechanisms.

In spite of the provision of the regulator-adjusting mechanism according to this invention, the watch movement can be designed into a thin modernized type, on account of the convenient and optimum arrangement of the regulator-adjusting mechanism relative to the automatic winding weight mass, balance wheel and barrel spring.

In the case of the inventive regulator-adjusting mechanism so far shown and described, a pull-out of the winding stem to its time-setting or its regulator-adjusting position, the stepping motion of the watch movement can be stopped or reinitiated, as optimally desired and in an automatic manner.

The pull-out operation of the winding stem to its regulator-adjusting position will be made at a substantially heavier resistance in comparison with any one of other operating positions of the stem, and therefore, a maladjustment of the regulator can effectively prevented.

By the specific design of the regulator-adjusting mechanism so far shown and described, overdue adjusting operation can be positively and effectively prevented.

The embodiments of the invention in which an exclusive property or privilege is claimed are as follows:

1. A watch characterized by the provision of a regulator-adjusting mechanism which comprises means for selectively positioning a winding stem at four different axial positions; a gear train operatively connected to said stem; a setting lever for positioning said gear train at four different positions in correspondence with said four different axial positions of said stem and means for operatively connecting directly a part of said gear train with a regulator of said watch at a predetermined axial position of said stem.

2. Watch as claimed in claim 1, wherein one member of said gear train is brought into its cooperating position with the regulator, with the said stem positioned at its regulator-adjusting position.

3. Watch as claimed in claim 1, wherein an adjusting member is provided which is connected at its one end with said regulator and adapted for cooperating engagement at its other end with a member of said gear train.

4. Watch as claimed in claim 3, wherein a clutch means is provided between said stem and said adjusting member for selective motion-transmission from said stem to said member.

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