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Ippoushi

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[54] **DAY-AND-DATE CHANGING DEVICE FOR A WRISTWATCH**

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[52] **U.S. Cl.** **58/58**

[51] **Int. Cl.** **G04b 19/24**

[58] **Field of Search** 58/4, 5, 58

[56] **References Cited**

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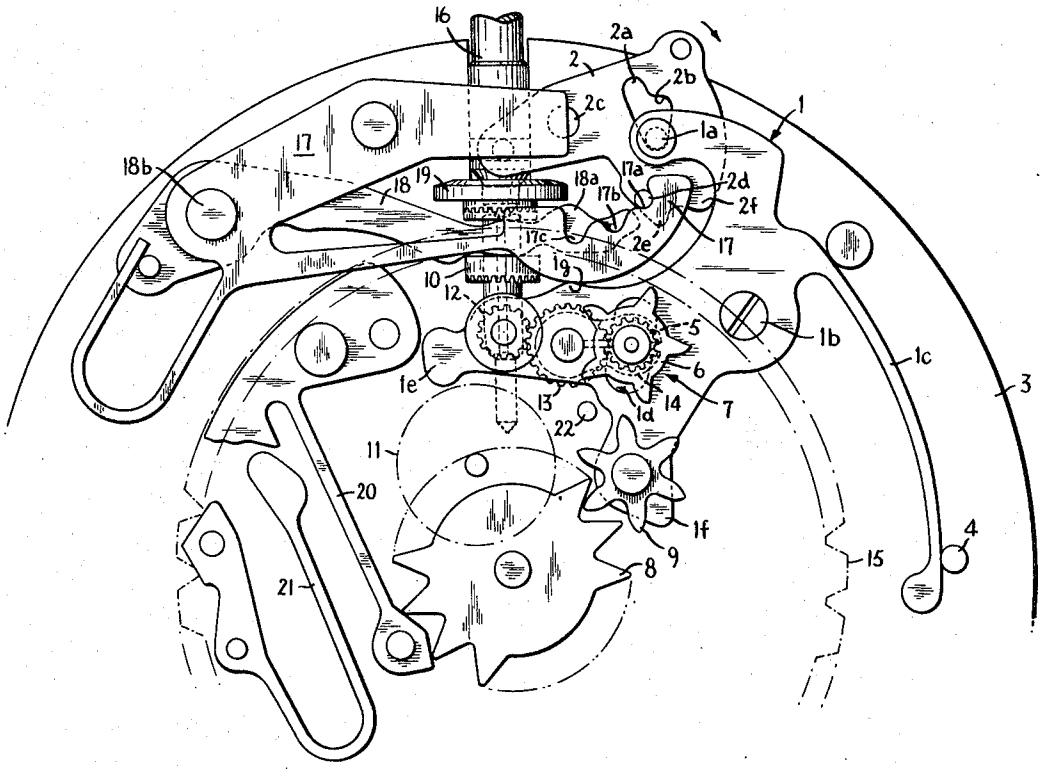
[57] **ABSTRACT**

A wristwatch has a set of watch hands for indicating the time and a day-and-date display for displaying the day and date. A rotatable winding stem is mounted on the wristwatch for manual axial movement to a first position wherein a day-and-date changing operation may be carried out in response to rotation of the winding stem and a second position wherein a hand-setting operation may be carried out in response to rotation of the winding stem. A rotatable setting wheel is moved into engagement with a day-and-date changing mechanism during axial movement of the winding stem to the first position and is moved into engagement with a hand-setting mechanism in response to axial movement of the winding stem to the second position. A clutch wheel clutches the winding stem to the setting wheel when the winding stem is in the first position whereby rotation of the winding stem effects rotational driving of the day-and-date changing mechanism and the clutch wheel clutches the winding stem to the setting wheel when the winding stem is in the second position whereby rotation of the winding stem effects rotational driving of the hand-setting mechanism. A set of levers coact together during axial movement of the winding stem between the first and second positions to engage the setting wheel with the hand-setting mechanism prior to clutching of the winding stem to the setting wheel.

6 Claims, 3 Drawing Figures



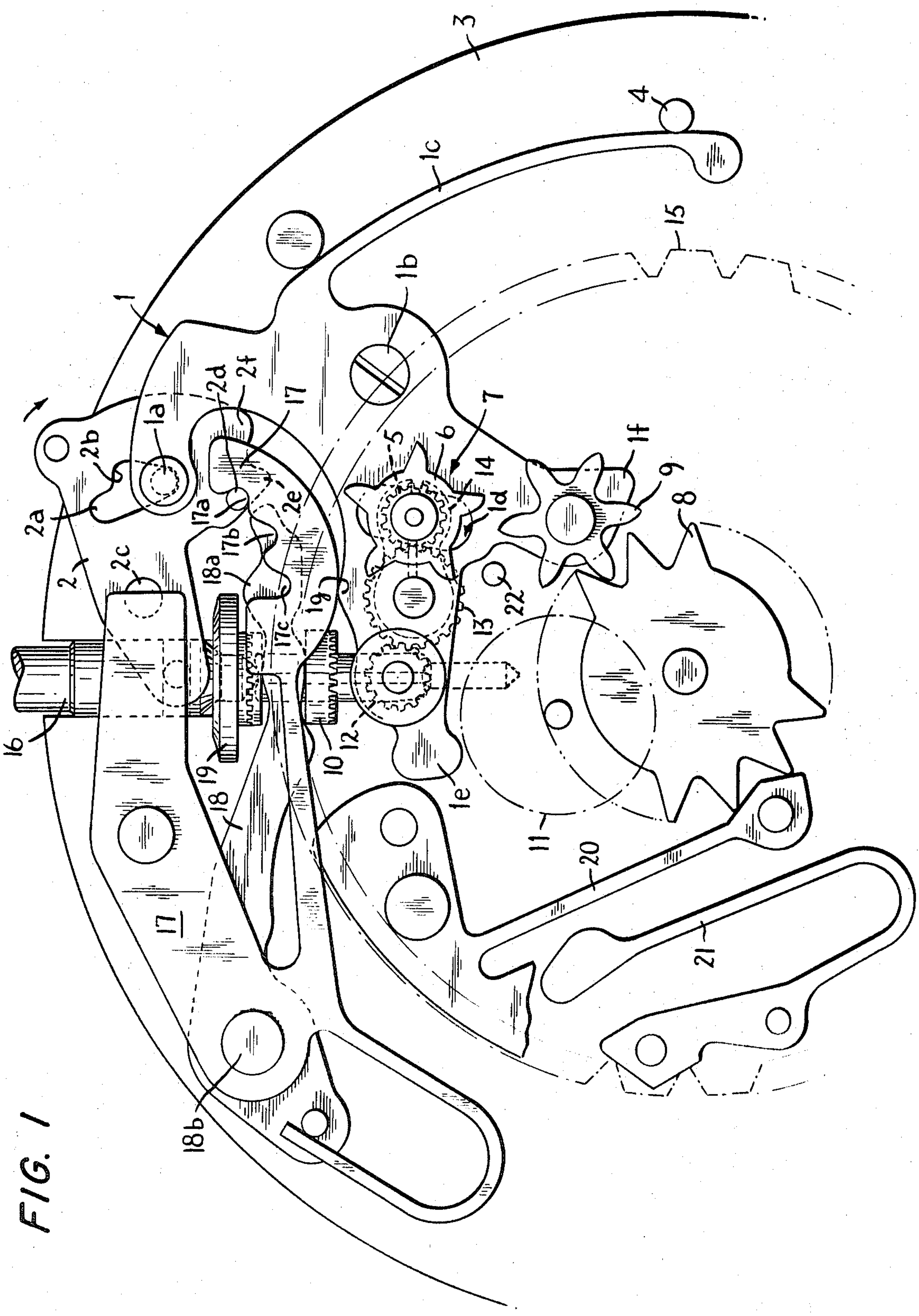

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FIG. 1

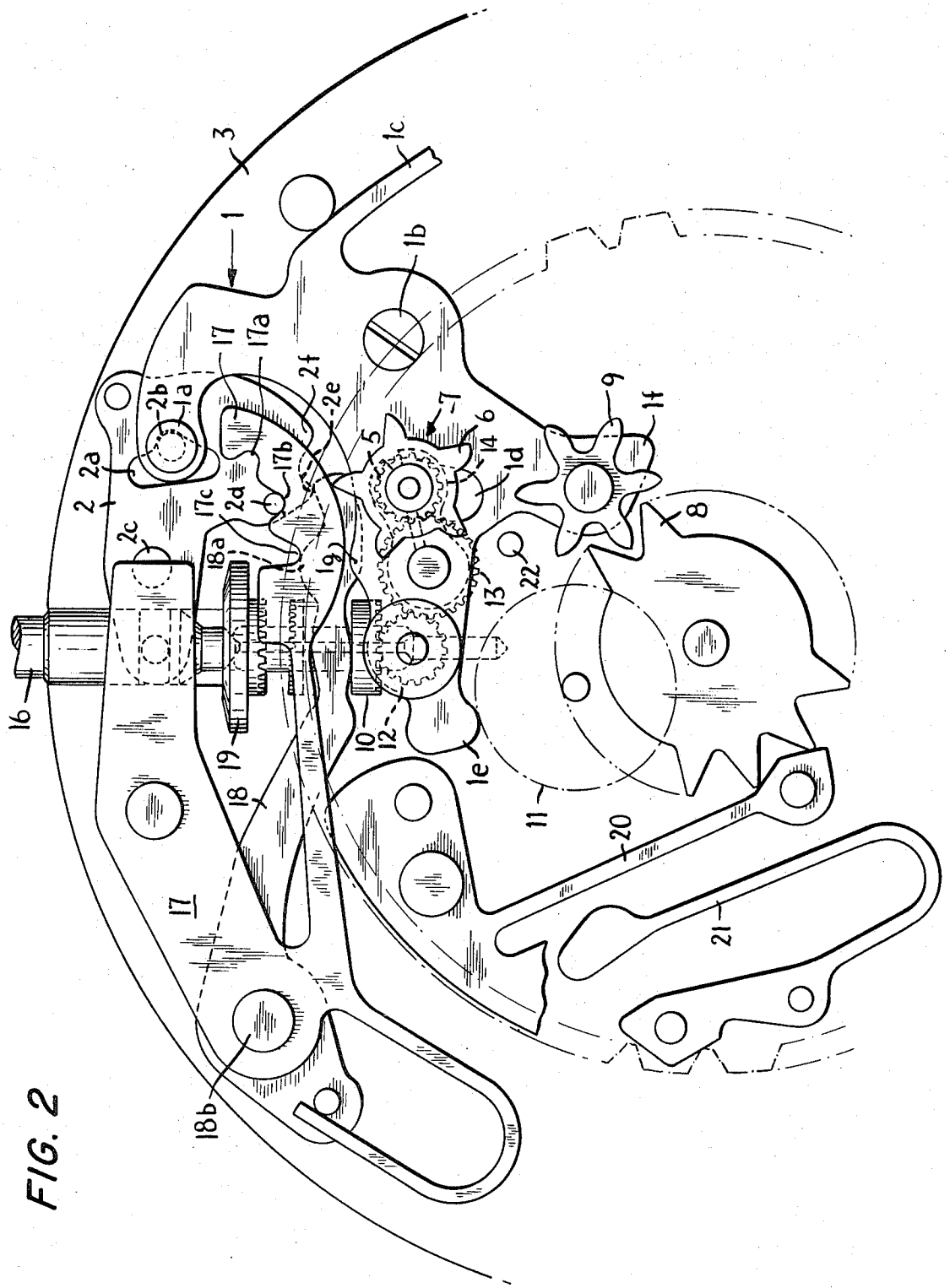
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FIG. 2

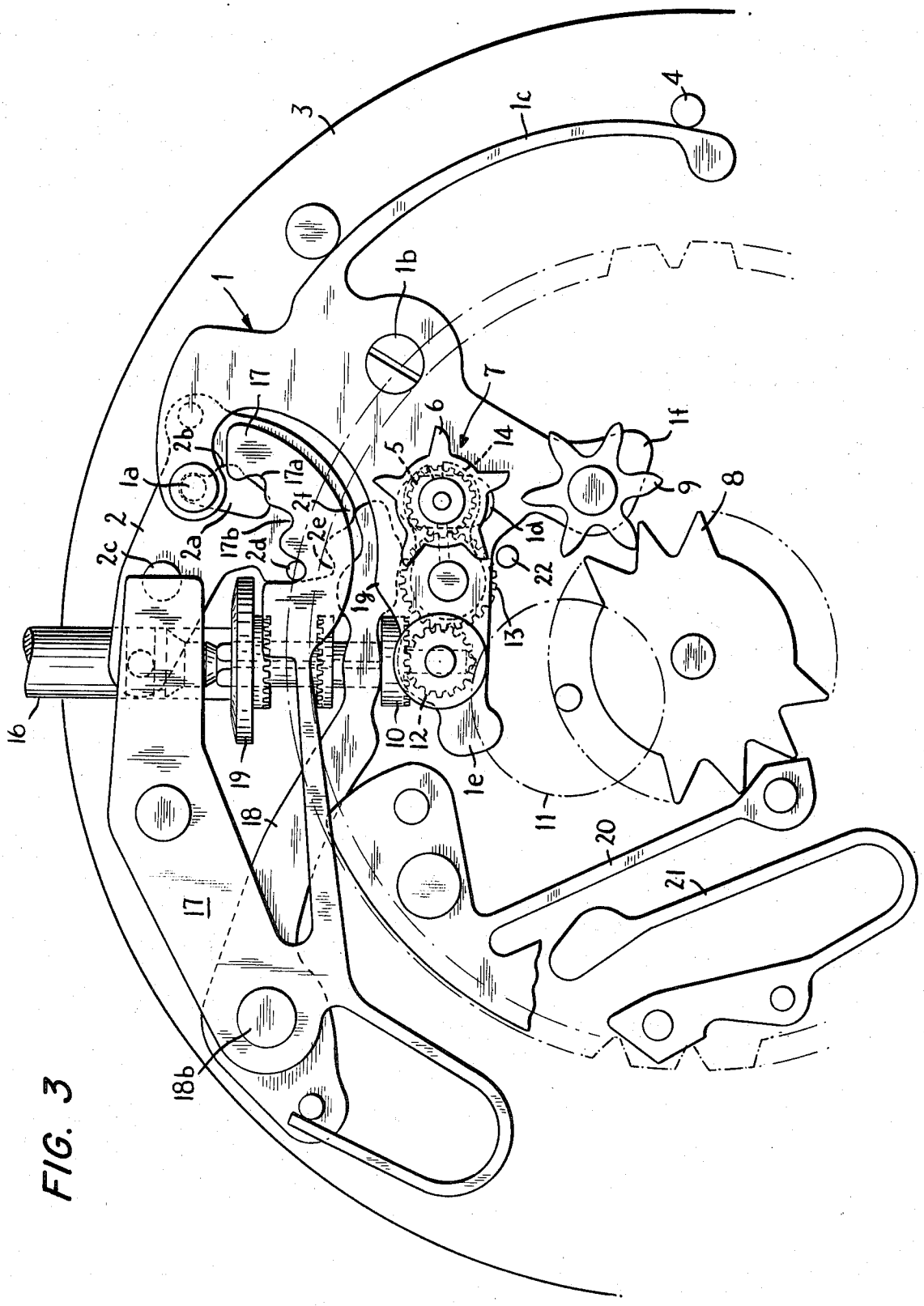
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FIG. 3

DAY-AND-DATE CHANGING DEVICE FOR A WRISTWATCH

The present invention relates to a day-and-date changing device for a wristwatch and more particularly to a day-and-date changing device for enabling day and date corrections to be accurately carried out in response to turning movement of a winding stem when same is in a given axial position and for preventing erroneous operation during axial movement of the winding stem.

Conventionally, day and date corrections have been effected in such a way that a day-date correcting wheel selectively engages with a date dial or a day star through a swing lever for effecting a day or date correction in response to clockwise or counterclockwise rotation of the winding stem when same is in a pulled out position.

In a watch embodying the above-mentioned correction mechanism, the setting of the watch hands is effected by further pulling out or pushing in the winding stem to engage a setting wheel with a minute wheel. In setting the watch hands, the hands move properly when the tooth crest of the setting wheel corresponds properly to the tooth bottom of the minute wheel or vice versa. If, however, the teeth of these wheels are staggered with respect to each other, a large tongue must be applied to the winding stem to rotate the setting wheel because the day-date correcting wheel is engaged with the minute wheel.

Consequently, the minute wheel is rotated to some extent in either direction upon engagement or disengagement with the setting wheel so that accidental operation of the watch hands may occur.

It is therefore a primary object of the present invention to provide a day-and-date changing device for a wrist watch whereby day and date corrections can be carried out easily and assuredly.

Another object of the present invention is to provide a day-and-date changing device for a wristwatch which eliminates any erroneous hand-setting corrections and day and date corrections during axial displacement of the winding stem.

According to the present invention, a day-and-date changing device for a wrist watch having a winding stem which is axially displaceable to a first working position wherein day and date corrections are effected and a second working position wherein hand setting is effected comprises a setting wheel lever assembly operative in response to pivotal movement of a setting lever which is pivoted in response to a push and pull movement of the winding stem, a setting wheel operative by the setting wheel lever assenbly and movable between a clutch wheel and a minute wheel for selectively engaging with both wheels to selectively effect day and date corrections and hand setting, and a setting lever spring having at least two concave portions for engaging with a dowel provided on the setting lever to limit the movement of the setting lever. The setting lever has a projecting engageable with a clutch lever to urge the clutch wheel into engagement with the setting wheel and the setting wheel lever assembly has a projection engageable with the setting lever spring. The setting lever is pivoted during axial displacement of the winding stem to move the dowel from one to the other of the concave portions to thereby act upon the projection of the lever assembly and to cause the projection of the

setting lever to act upon the clutch lever with a predetermined time lag with the result that the clutch wheel engages with said setting wheel with a predetermined time lag during which time the setting wheel engages with the minute wheel while the setting wheel is in a freely rotatable condition.

Having in mind the above and other objections that will be evident from an understanding of this disclosure, the present invention comprises the combinations and arrangements of parts as illustrated in the presently preferred embodiment of the invention which is hereinafter set forth in sufficient detail to enable those persons skilled in the art to clearly understand the function, operation, construction and advantages of it when read in conjunction with the accompanying drawings, wherein like reference characters denote like parts in the various views, and wherein:

One embodiment of the present invention will now be described with reference to FIGS. 1–3. A setting lever assembly **1** comprises a setting pin **1***a* engaging with a guide aperture **2***a* provided in a setting lever **2**, a pin **1***b* pivotally mounting the setting wheel lever assembly **1**, an elongated resiliently and elastically deformable portion **1***c* engaging with a stationary pin **4** attached to a base plate **3**, and an arm **1***e* having therein an elongated aperture **1***d*. A day-date correcting wheel assembly **7** including a pinion **5** and a pawl wheel **6** is mounted for movement within the elongated aperture **1***d*. The setting lever assembly **1** further includes another arm **1***f* on which a day-star driving wheel **9** is pivotally mounted and the driving wheel **9** is in mesh with a day star **8**.

The setting wheel lever assembly **1** has elasticity to the extent that the arm **1***f* can move towards the elongated portion **1***c* due to resilient bending of the portion **1***c*. The setting wheel lever assembly **1** further comprises a rotatable setting wheel **12** disposed between and engageable with a clutch wheel **10** and a minute wheel **11** and rotatably mounted on the arm **1***e* for engagement with the pinion **5** of the day-date correcting wheel assembly **7** through an intermediate gear wheel **13**. The day-date correcting wheel assembly **7** is freely displaceable within the elongated aperture **1***d* of the setting wheel lever assembly **1**.

The intermediate wheel **13** is rotatably mounted on the setting wheel lever assembly **1** in the same way as the setting wheel **12**. The intermediate wheel **13** and the day-date correcting wheel assembly **7** are connected by means of a swing lever **14** and the pins about which these wheels rotate are in frictional engagement with the swing lever **14**. Consequently, the swing lever **14** can swing or pivot about the intermediate wheel **13**. In response to the swinging movement of the swing lever **14**, the day-date correcting wheel assembly **7** swings about the elongated aperture **1***d* in the setting wheel lever assembly **1** so that the pawl wheel **6** of the day-date correcting wheel assembly **7** engages with either a date dial **15** or with the day star driving wheel **9**.

At this time, the setting pin **1***a* on the setting wheel lever assembly **1** engages with the guide aperture **2***a* of the setting lever **2**. The guide aperture **2***a* has a stepped portion **2***b* at the inner surface thereof profiled to engage with and push the setting pin **1***a* so as to pivot the setting wheel lever assembly **1** in a counterclockwise direction about the pin **1***b* when the setting lever **2** is pivoted clockwise around the mounting pin **2***c* in the

direction shown by the arrow in FIG. 1, in response to the pulling out of the winding stem.

Just before the setting pin 1*a* is pushed by the stepped portion 2*b* of the setting lever 2, a projection 1*g* provided on the arm 1*e* of the setting wheel lever assembly 1 engages with and pushes against a setting lever spring 17 driven by a dowel 2*d* of the setting lever 2 thereby resiliently bending the setting wheel lever assembly 1. Thus the guide aperture 2*a* of the setting lever 2 functions to guide the setting pin 1*a* as well as to retain the setting wheel lever assembly 1 in position as it is displaced.

A clutch lever 18 is pivotal about a pin 18*b* and is movable to effect engagement of the clutch wheel 10 with either a winding pinion 19 or with the setting wheel 12. The clutch lever 18 is displaced into one working position by the projecting portion 2*e* of the setting lever 2 when the winding stem is pulled out one step and the clutch lever 18 is further displaced into another working position by the projecting portion 2*f* of the setting lever 2 when the winding stem is further pulled out another step. It is to be noted that the displacement of the clutch lever 18 by the projecting portion 2*f* is carried out just after the setting wheel lever assembly 1 is displaced by means of the setting lever spring 17. A banking pin 22 is fixed on the base plate 3 for stopping the displacement of the swing lever 14. Also fixed on the base plate 3 are a day jumper 20 and a date jumper 21.

The operation of the day-and-date changing device according to the invention will now be described.

FIG. 1 shows the components in their mainspring winding positions wherein the watch mainspring may be wound. In this position, the clutch lever 18 is disengaged from the projecting portion 2*e* of the setting lever 2 whereby the clutch lever 18 is biased around the pin 18*b* in a counterclockwise direction by the setting lever spring 17. Accordingly, the clutch wheel 10 is urged into engagement with the winding pinion 19 so that the mainspring may be wound in response to rotation of the winding stem.

In this position, the swing lever 14 can swing freely because the setting wheel 12 is disengaged from both the clutch wheel 10 and the minute wheel 11. Thus, even if one tooth of the pawl wheel 6 of the day-date correcting wheel assembly 7 happens to strike against one tooth of the date dial 15 or one tooth of the day-star driving wheel 9 due to the accidental swinging movement of the swing lever 14, neither the date dial 15 nor the day-star driving wheel 9 will be rotated because the setting wheel 12 is in freely rotatable condition.

FIG. 2 shows the components in their day-and-date changing positions wherein the day and date corrections can be carried out and this condition is obtained by pulling out the winding stem one step or increment. During pulling out of the winding stem, the setting lever 2 is pivoted in a clockwise direction around the pin 2*c* so that the dowel 2*d* of the setting lever 2 engages with a central one 17*b* of three concave portions 17*a* and 17*c* provided on the setting lever spring 17. At the same time, the clutch lever 18 is pivoted in a clockwise direction by means of the projecting portion 2*e* of the setting lever 2 to the extent that the clutch wheel 10 is disengaged from the winding pinion 19 and engaged with the setting wheel 12.

The dowel 2*d* of the setting lever 2 slides along the setting lever spring 17 from the concave portion 17*a* to the concave portion 17*b* during the pulling-out of the winding stem 16 so that the setting lever spring 17 is resiliently flexed a short distance in a clockwise direction until it moves adjacent to the projecting portion 1*g* of the setting wheel lever assembly 1. The setting lever spring 17, however, never pushes against the projecting portion 1*g* of the setting wheel lever assembly 1.

At this time, the setting lever 2 is pivoted until the stepped portion 2*b* of the guide aperture 2*a* moves adjacent the setting pin 1*a* without pushing it. If the winding stem 16 is then rotated leftwardly, the day-date correcting wheel assembly 7 is rotated in a counterclockwise direction through the setting wheel 12 and the intermediate wheel 13 simultaneously with clockwise swinging movement of the swing lever 14 around the pin of the intermediate wheel 13 whereby the pawl wheel 6 of the day-date correcting wheel assembly 7 engages with the day-star driving wheel 9 to thereby effect a day correction. On the other hand, if the winding stem 16 is rotated rightwardly, the swing lever 14 is swung in a counterclockwise direction around the pin of the intermediate wheel 13 whereby the pawl wheel 6 of the day-date correcting wheel assembly 7 engages with the date dial 15 to thereby effect a date correction. By such a construction, the day-date correcting wheel 7 is rotated by the setting wheel 12 and the intermediate wheel 13 and in addition, the wheel assembly revolves around the pin of the intermediate wheel 13 by means of the swing lever 14 to thereby perform the day and date corrections.

FIG. 3 shows the components in their hand-setting positions wherein the hand-setting operation can be carried out and this condition is obtained by pulling out the winding stem two steps or increments. When the winding stem is pulled out two steps, the setting lever 2 is further pivoted in the clockwise direction so that the dowel 2*d* of the setting lever 2 slides along the setting lever spring 17 from the concave portion 17*b* to the concave portion 17*c*. At this time, the projecting portion 2*e* of the setting lever 2 is also pivoted in the clockwise direction, but it never presses against the clutch lever 18 until it reaches a predetermined position because the surface of the clutch lever 18 against which the projecting portion 2*e* strikes is also pivoted in a clockwise direction to the predetermined position. During clockwise movement of the setting lever 2, the clutch lever 18 is pivoted in the clockwise direction by means of the projecting portion 2*f* of the setting lever 2 while the projecting portion 2*e* of the setting lever 2 moves within a recessed portion of the clutch lever to thereby temporarily render the clutch lever 18 inoperative during the predetermined pivotal movement of the clutch lever during which time the dowel 2*d* of the setting lever 2 pushes the setting lever spring 17 in a clockwise direction against the elasticity.

The projecting portion 1*g* of the setting wheel lever assembly 1 is pushed by the setting lever spring 17 because the latter is pivoted further when the dowel 2*d* of the setting lever 2 slides along the setting lever spring 17 from the concave portions 17*b* to 17*c* than when it slides from the concave portions 17*a* to 17*b*. Accordingly, the arms 1*e* and 1*f* of the setting wheel lever assembly 1 are pivoted to some extent in the counterclockwise direction around the pin 1*b* against the elasticity of the arm 1*c* thereby disengaging the set-

ting wheel **12** from the clutch wheel **10.** During its pivotal movement, the clutch lever **18** reaches some intermediate position wherein the setting wheel **12** is disengaged from the clutch wheel **10** and the setting wheel is placed in a freely rotatable condition wherein same engages with the minute wheel **11.** When the dowel **2***d* of the setting lever **2** slides over the setting lever spring **17** from the concave portions **17***b* to **17***c*, the setting lever spring **17** is restored to the depth of the concave portion **17***c* due to its elasticity.

On the other hand, the setting wheel lever assembly **1** is not restored to its preceding position and instead is retained in the position where it is pressed by the setting lever spring **17** because the setting pin **1***a* on the setting wheel lever assembly **1** is engaged with the guide aperture **2***a*. At the same time that the dowel **2***d* slides over the setting lever spring **17** from the concave portions **17***b* to **17***c*, the clutch lever **18** is further pivoted in the clockwise direction by the projecting portion **2***f* of the setting lever **2** so that the clutch wheel **10** again engages with the setting wheel **12.** In this way, the hand setting operation can be carried out.

It will be appreciated, therefore, that the clutch wheel **10** is engaged with the setting wheel **12** at a time period later than the setting wheel **12** is engaged with the minute wheel **11.** Accordingly, the setting wheel **12** is in a freely rotatable condition when it engages with the minute wheel **11.** It is to be noted, in this case, that the day-date correcting wheel assembly **7** is rotated in response to rotation of the setting wheel **12,** but the movement of the swing lever **14** due to pivotal movement of the lever assembly **1** is limited by means of the banking pin **22** on the one hand, and limited so as not to swing by means of the clutch lever **18** on the other hand.

As described above, the day-and-date device according to the present invention comprises a setting wheel lever assembly **1** operative by a setting lever **2,** a setting wheel **12** rotatably mounted on the setting wheel lever assembly and disposed between a clutch wheel **10** and a minute wheel **11,** a setting lever spring provided with at least two concave portions **17***b* and **17***c* for engaging with a dowel **2***d* of the setting lever **2** to limit the degree of pivotal movement of the setting lever **2,** a projecting portion **1***g* provided on the setting wheel lever assembly **1** for engaging with the setting lever spring when the dowel **2***d* of the setting lever **2** slides over the setting lever spring **17** from one concave portion to the other, a guide aperture provided in the setting lever **2** for guiding and limiting a pin of the setting wheel lever assembly **1,** and a projecting portion **2***f* on the setting lever **2** for acting upon the clutch lever **18** after rotation of the setting wheel lever assembly **1.**

Moreover, the device according to the present invention is constructed in such a manner that the setting wheel **12** engages with a minute wheel **11** in the freely rotatable condition while the clutch wheel engages with the setting wheel with a time lag when the winding stem is displaced in the hand-setting position. Accordingly, the setting wheel **12** can engage with or disengage from the minute wheel **11** without applying any rotational force thereto even if the setting wheel does not happen to properly engage with the minute wheel because the setting wheel is in the freely rotatable condition.

By such a construction, accidental operation of the watch hands is effectively prevented. Moreover, according to the present invention, the dowel **2***d* of the setting lever **2** completely falls in any of the concave portions **17***a* to **17***c* without resting therebetween because the restoring force caused by the setting lever spring **17** is enhanced by the restoring force of the setting wheel lever assembly **1** whereby the winding stem is accurately and properly positioned.

What is claimed is:

1. In a wristwatch having a set of watch hands for indicating the time and a day-and-date display for displaying the day and date: a rotatable winding stem mounted for manual axial movement to a first position wherein a day-and-date changing operation may be carried out and a second position wherein a hand-setting operation may be carried out; rotatable day-and-date changing means operative when rotationally driven to effect a day change and a date change on the day-and-date display; rotatable hand-setting means operative when rotationally driven to effect setting of the watch hands; a rotatable setting wheel mounted for movement into engagement with said day-and-date changing means in response to axial movement of said winding stem to said first position and for movement into engagement with said hand-setting means in response to axial movement of said winding stem to said second position; clutching means for clutching said winding stem to said setting wheel when said winding stem is in said first position whereby rotation of said winding stem effects rotational driving of said day-and-date changing means and for clutching said winding stem to said setting wheel when said winding stem is in said second position whereby rotation of said winding stem effects rotational driving of said hand-setting means; and means coacting with said clutching means during axial movement of said winding stem between said first and second positions for effecting engagement of said setting wheel with said hand-setting means prior to clutching of said winding stem with said setting wheel.

2. A wristwatch according to claim **1**; wherein said clutching means comprises a rotatable clutch wheel, and a pivotal clutch lever pivotal in response to axial movement of said winding stem for engaging said clutch wheel with said setting wheel.

3. A wristwatch according to claim **1**; including a first pivotal lever having said setting wheel rotatably mounted thereon whereby pivotal movement of said lever effects movement of said setting wheel; and wherein said means coacting with said clutching means comprises a second pivotal lever pivotal into engagement with said first pivotal lever to effect disengagement of said setting wheel from said clutching means in response to axial movement of said winding stem between said first and second positions.

4. A wristwatch according to claim **3**; including a pivotal setting lever coupled to said winding stem to undergo pivotal movement in response to axial movement of said winding stem and having a projection thereon; and wherein said second lever has a set of concave surface portions engageable with said projection during pivotal movement of said setting lever whereby said projection engages with and effects movement of said second lever into engagement with said first lever.

5. A wristwatch according to claim **4**; wherein said first pivotal lever has a camming projection engageable with said second lever during pivotal movement of the latter by said setting lever.

6. A wristwatch according to claim 4; wherein said clutching means comprises a rotatable clutch wheel axially movable along said winding stem, and a pivotal clutch lever engageable with said clutch wheel to axially move same into clutching engagement with said setting wheel in response to pivotal movement of said setting lever.

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