United States Patent

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[31] **3606/69**

[54] **WATCH WITH MANUALLY ADJUSTABLE TIME-ZONE-SETTING MECHANISM**
5 Claims, 3 Drawing Figs.

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[51] **Int. Cl.** **G04b 19/22**
[50] **Field of Search** 58/21, 42.5, 43, 44, 58, 85.5

[56] **References Cited**
UNITED STATES PATENTS

3,318,085	5/1967	Shau-Tang Lee	58/43
3,421,311	1/1969	Bennett et al	58/85 5

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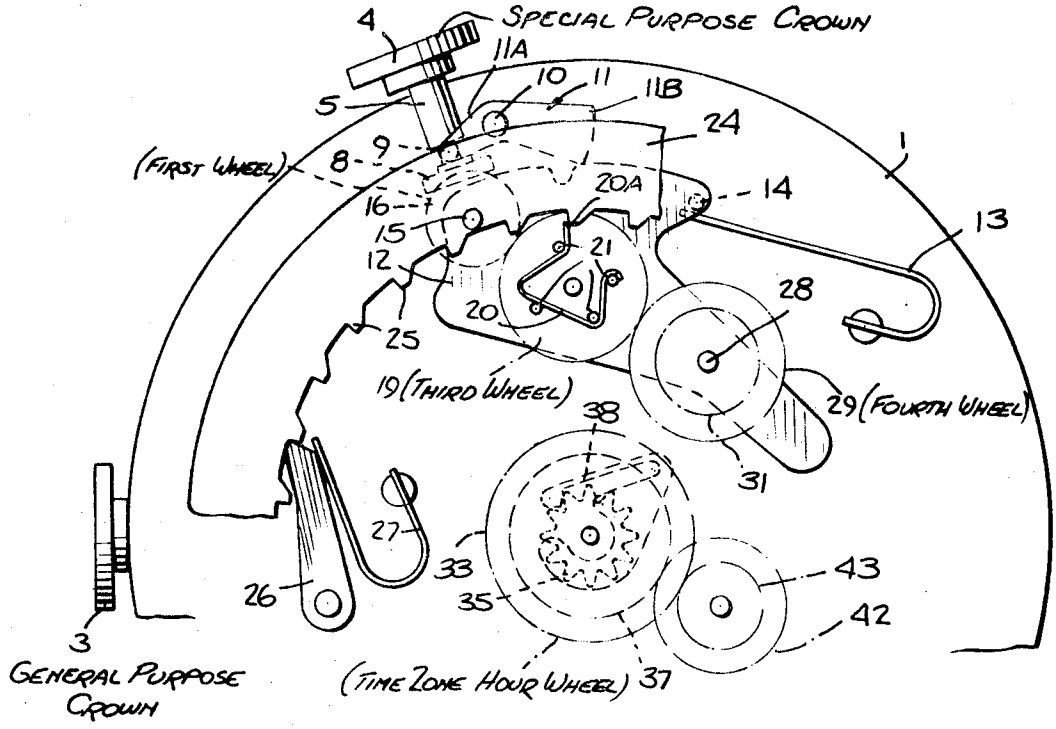
ABSTRACT: A watch provided with a time-zone-setting mechanism which is manually adjustable to incrementally shift the position of a local time hour hand in either direction, the various hands of the watch being otherwise settable by a general purpose crown. The watch also includes a date calendar or other indicator, a special purpose crown being provided which, in one axial position, adjusts the time-zone-setting mechanism and, in another position, adjusts the date calendar or other indicator.



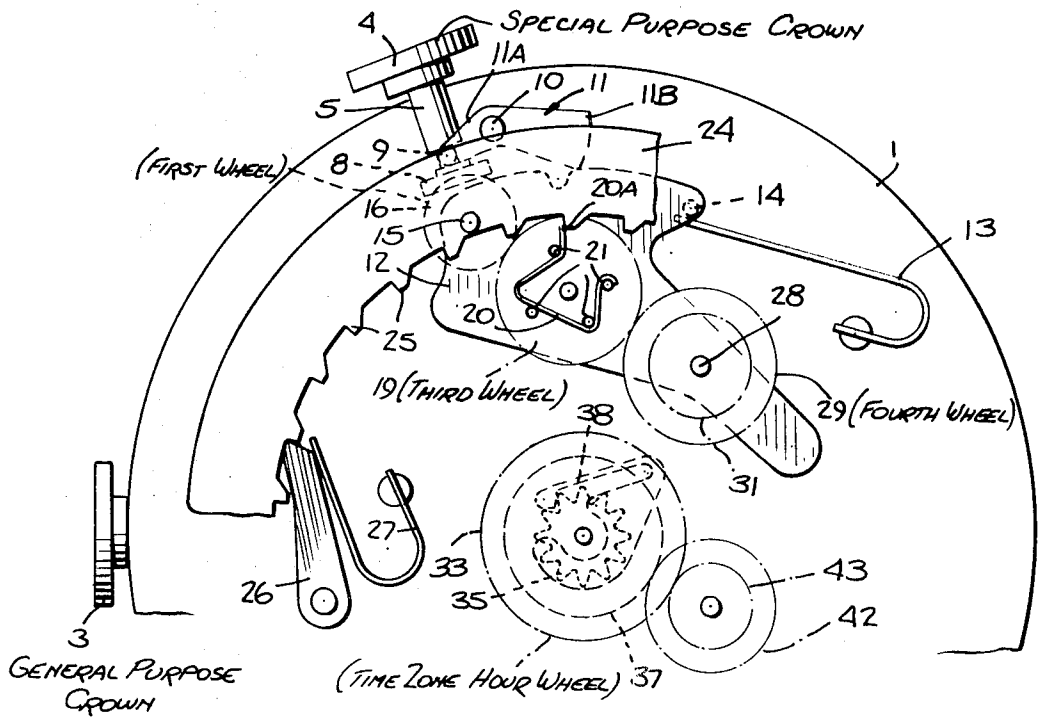


Fig. 1.

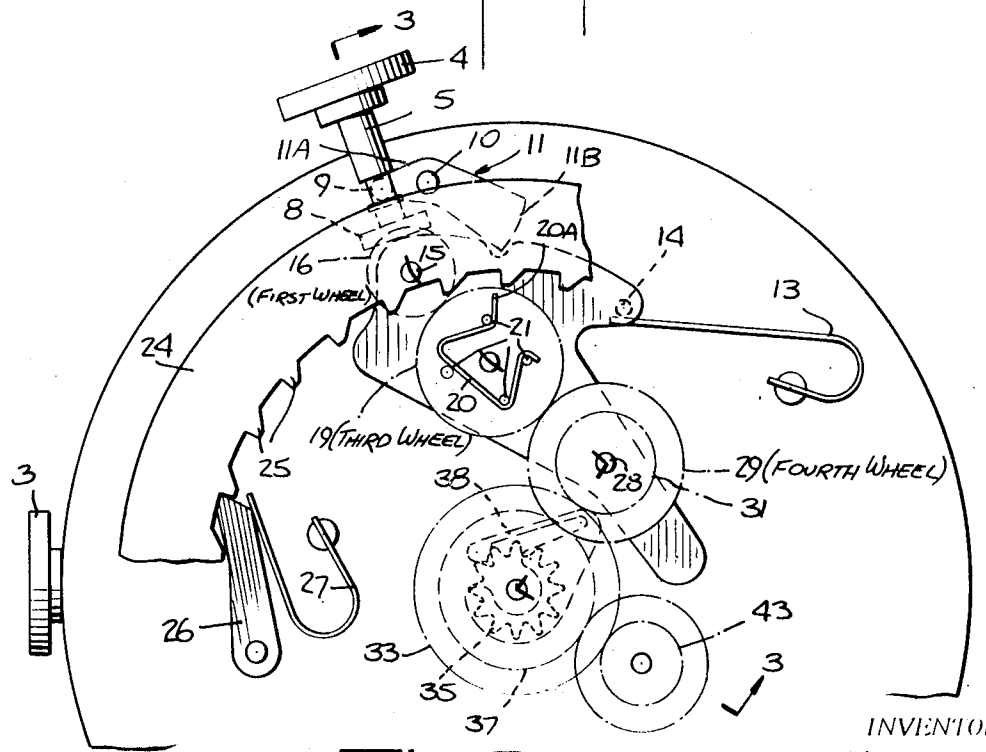


Fig. 2.

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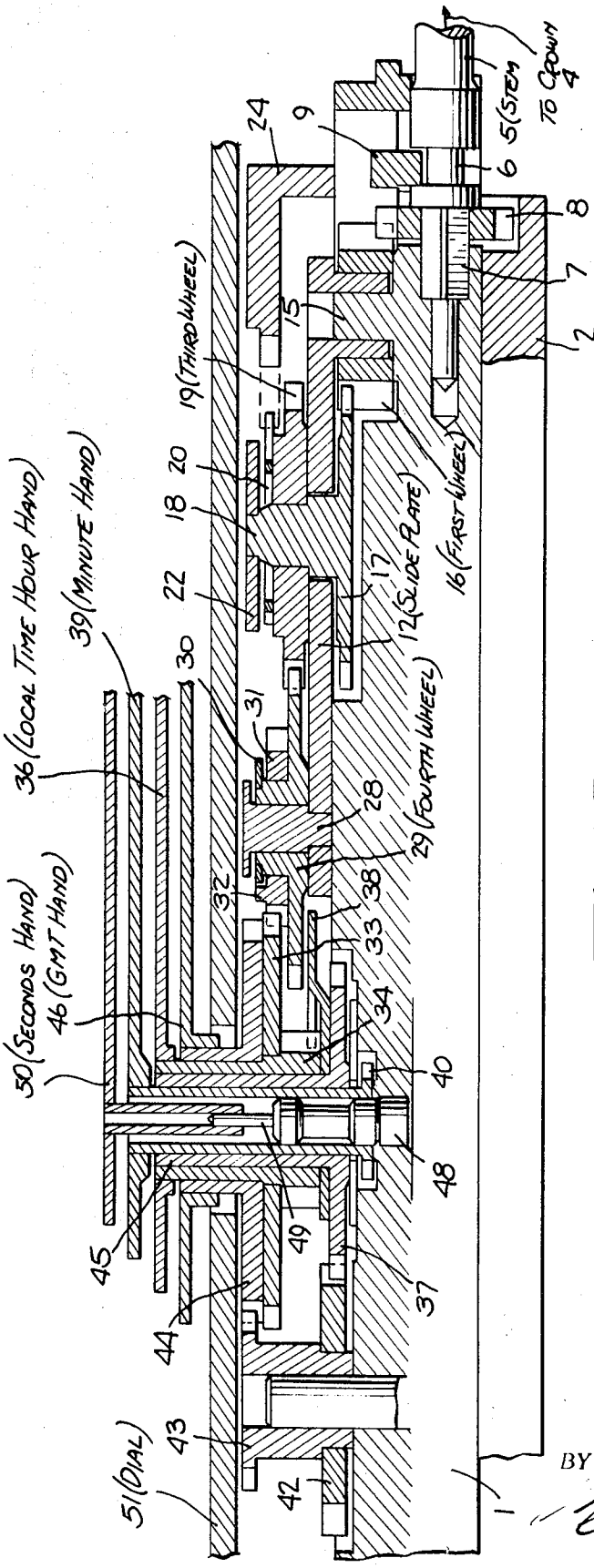

FIG. 3

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WATCH WITH MANUALLY ADJUSTABLE TIME-ZONE-SETTING MECHANISM

BACKGROUND OF INVENTION

This invention relates generally to timepieces; and more particularly to a watch whose local time hand may be adjusted incrementally to effect time zone changes.

Greenwich mean time (GMT) is the local mean time of the Greenwich meridian (longitude 0°). The difference between standard time in any zone and GMT is equal to the longitude of the standard meridian of the zone expressed in hours (1 hour for each 15°). GMT is expressed on a 24-hour or universal scale, whereas local time is generally indicated on a 12-hour scale, the 24-hour daily period being divided into a.m. and p.m. 12-hour intervals.

Watches are known that are capable of concurrently displaying both GMT and local time, which watches —in addition to having the usual hour, minute and sweep-second hands, —include a GMT hand which makes a full revolution per 24-hour period.

Watches are also known which are capable of incremental adjustment of the local hour hand to effect forward or backward correction thereof by one or more hours, so that the local hour setting may be made to correspond with a given time zone. In a watch of this type, a general purpose crown is provided to manually set the hour and minute hands in the usual manner. In order, however, to effect incremental setting of the hour hand, it becomes necessary to provide a special purpose crown whose operation is independent of the general purpose crown.

When, therefore, the watch further includes a date calendar indicator, an alarm mechanism, or other auxiliary indicators operated by the timepiece motor, additional crowns or manual operation members on the outside of the case are ordinarily required to effect adjustment of the auxiliary indicators.

A watch equipped with three or more crowns is disadvantageous, and not only because this number of external crowns is unattractive from the commercial and aesthetic standpoint. Each crown is attached to a stem extending into the case so that in a waterproof watch, special sealing gaskets are required in conjunction with each stem. Moreover, a watch having three crowns and stems and other elements associated therewith is excessively complicated and expensive, as well as more difficult to service and maintain.

SUMMARY OF INVENTION

In view of the foregoing, it is the main object of this invention to provide a watch having an adjustable time-zone-setting mechanism operated by a crown which also serves to carry out other setting or regulating operations, thereby reducing the required number of crowns and stems associated therewith.

More specifically, it is an object of the invention to provide a watch having a general purpose crown for the usual adjustment of the hands and a special purpose crown to effect, in one axial position, a manual adjustment of a time-zone-setting mechanism for the local hour hand only, and, in another axial position, an adjustment of a date calendar or other indicator. Alternatively, the same crown may be used in one axial position to set the hands and in another axial position to incrementally set the local hour hand to a desired time zone.

Among the significant advantages of the invention are the improvement in the aesthetic appearance of the watch by reason of a fewer number of crowns, a reduction in manufacturing costs and a simplification of servicing. Because of the fewer number of stems, the need for watertight gaskets is likewise reduced.

A watch in accordance with the invention may have two hour hands, one hand being permanently coupled to the drive motor (electronic or mechanical) to indicate either local time at a home base or GMT, and a special, incrementally adjustable hour hand to indicate local time in a given zone. This special hour hand may also be permanently coupled to the motor by way of differential gears or the like, or the watch may be equipped to bring about a temporary disengagement of this special hour hand and the drive means therefor. Of course, the coupling between the motor and the hour hand or hands may be temporarily disconnected when setting the hands.

In certain instances, a single hour hand for the watch is sufficient, which single hand may be adjusted in accordance with the time zone the wearer enters. Furthermore, instead of an hour hand adjustable in single steps, another incrementally adjustable indicator may be provided to indicate by how many hours local time differs from the time indicated by the home base or GMT hand, or how many hours are to be added to or subtracted from local time, in order to determine home base time or GMT.

A watch in accordance with the invention has special advantages in an arrangement wherein the setting stem serves in one operative position to effect incremental adjustment of the hour hand and in another position to set a calendar indicator provided with quick-set means to advance a date indicator ring in that, under certain circumstances, after a back setting of the incrementally adjustable hour hand is effected to set it for another time zone, the hour hand may display midnight twice, as a consequence of which the date ring is moved twice within one or a few hours instead of once. In such rare instances, this incorrect indication of date may be corrected quickly and without difficulty by reason of the quick-set device.

The combination of both setting functions (i.e., calendar and time zone adjustment) in a single setting arrangement makes possible the manufacture of a modern mechanical watch of the winding or self-winding type, or of the electronic type provided with a date indicator and a time zone adjustment mechanism with only two setting crowns. In this instance, one crown serves as a general purpose crown to adjust the hands and also, in the case of a spring-wound watch, to effect winding, whereas the other crown serves as a special purpose crown to allow adjustment of the date ring and also possibly a day ring as well as to effect incremental time zone adjustment of the local hour hand.

BRIEF DESCRIPTION OF DRAWING

For a better understanding of the invention as well as other objects and features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawing wherein:

FIG. 1 schematically shows a wrist watch in accordance with the invention in a first setting position;

FIG. 2 is the same as FIG. 1 except that the watch is in a second setting position; and

FIG. 3 which is in a scale enlarged with respect to FIGS. 1 and 2, shows a section taken in the plane indicated by lines 3–3 in FIG. 2.

DESCRIPTION OF INVENTION

Referring now to the drawing, there is illustrated a wrist watch in accordance with the invention wherein a gear train bridge 2 is affixed by screws to a pillar plate 1. A general purpose crown 3, shown in FIGS. 1 and 2, and its associated mechanism (not shown) serve to set the hour and minute hands of the watch in the usual manner. In the drawing, the main spring, the escapement and other conventional components of the watch which are well known to those skilled in the art, are omitted. Only those elements of the gear train are shown which are relevant to either a calendar device or to a time-zone-setting mechanism.

The watch is also provided with a special purpose crown 4, attached to the end of stem 5, which crown makes possible two distinct adjustments. The first adjustment, which is illustrated in FIG. 1, is to advance the calendar ring. The second adjustment, which is illustrated in FIG. 2, is to effect incremental adjustment of the local time hour hand.

Stem 5, as best seen in FIG. 3, is provided with a neck portion 6 of reduced diameter and a square-shaped portion 7. Loosely fitting on stem portion 7 is a wheel 8 having a square hole whereby stem portion 7 may be shifted axially with respect to wheel 8 but cannot rotate relative thereto.

A setting lever 11 (note FIGS. 1 and 2) is provided, the lever having two arms 11A and 11B and being rotatable about a pivot pin 10. Arm 11A of lever 11 carries a pin 9 which is received within the groove defined by neck portion 6 of the stem and is movable therewith to cause the lever to swing. The free end of the other arm 11B of the lever presses against the periphery of a slide plate 12 which is rotatable about a fixed pivot point 15.

First wheel 16 drives a second wheel 17 whose axle 18 passes through an opening in slide plate 12 and is affixed to a third wheel 19. A flat spring 20, which is bent into a "U" configuration, is held on the surface of third wheel 19 by several spaced pins 21, which are disposed on alternate sides of the spring whereby the spring is trapped thereby. One end of spring 20 is extended to provide a finger 20A for engaging a tooth 25 on the inner periphery of calendar 24 and to move this ring in a stepwise manner.

In order to effect a movement of calendar ring 24 by rotation of the second and third wheels 17 and 19 so as to cause the ring to shift one tooth, a so-called date lock 26 is provided which is biased by a spring 27. Lock 26 is pivotally mounted and is arranged to enter the space between adjacent teeth 25 in the calendar ring.

However, a backward rotation of stem 5 will not affect the position of calendar ring 24 in that the end 20A of spring 20, when striking tooth 25 would be lifted off its associated pin 21 and jump the tooth. To prevent spring 20 from falling out, a disc 22 is fixed to the axle 18 of third wheel 19 on which the spring is mounted.

Instead of having a drive means to move a calendar ring 24, of the type above-described, other arrangements may be used for this purpose. For instance, one may place a disc on third wheel 19, the disc being operated by means of a Breguet toothing combined with said wheel. A drive pin fixed to the disc could therefore move the date ring by cooperating with a tooth 25 thereof. The Breguet toothing permits a back motion between wheel 19 and the drive disc placed loosely on it. It is also possible to provide other means to carry out this function whereby a drive member operates upon rotation of wheel 19 in one direction and wherein free wheeling is effected between these members when wheel 19 rotates backwards. For this purpose an index wheel fixed to wheel 19 may, for example, be sufficient in combination with a pawl finger held by the driving member.

Carried on slide plate 12 on an axle 28 is a fourth wheel 29 which rotates freely thereon. Third wheel 19 and fourth wheel 29 are permanently in meshing engagement. A wheel 31, which intermeshes with a wheel 33, is loosely mounted in axle 28 of the fourth wheel 29. A sector-shaped driver 30 is fixed to wheel 29. When rotating wheel 29, driver 30 is caused to abut the end of an arc-shaped bar 32, whereby wheel 31 is moved thereby. Driver 30 and bar 32 allow for a relatively large play. As will be later seen, this is of importance when switching one of the hour hands.

Wheel 33, which may be designated the time zone hour wheel, is fixed to a tube 34 carrying the adjustable local time hour hand 36. Attached to the lower end of tube 34 is a star wheel 35. This star wheel is engaged by the hook-shaped end of a bent spring 38, held by hour wheel 37. Hour wheel 37 is driven in the conventional manner by a reduction gear train (not shown) whose pinion meshes with the toothing at the lower end of a minute tube 40 which at its upper end carries a minute hand 39.

Hour wheel 37 intermeshes with an intermediate hour wheel 42. The intermediate hour wheel 42 is combined with a pinion 43 which acts to transfer rotation of the hour wheel 42 to a second hour wheel 44 mounted on a tube 45 to which is fixed the GMT hand 46 which is not adjustable. In the example illustrated, the ratio of gearing between the hour wheels 37 and 44 is selected so that GMT hour hand 46 turns only half as fast as local time hour hand 36. Thus the GMT hand makes a full revolution in 24 hours, whereas the local time hand completes a revolution in 12 hours. Also shown is the second hand 50, the second hand axle 49, as well as the supporting tube 48 therefor. The various hands rotating with respect to a watch dial 51.

CALENDAR ADJUSTMENT

Referring now to FIG. 1, the manner in which adjustment of calendar ring 24 is effected will now be described, the setting stem 5 being shown in its normal axial position. It will be seen that spring 13 urges slide plate 12 into the position shown in this figure. When rotating crown 4 clockwise, third wheel 19 is rotated until the free end 20A of spring 20 engages a tooth 25 on the calendar ring.

A further rotation of crown 4 in the same direction, with sufficient effort to overcome the action of spring 27 against date lock 26, serves to lift the date lock and to cause calendar ring 24 to advance one day. It will be appreciated that a clockwise rotation of crown 4 has no effect on the hour hand.

TIME ZONE ADJUSTMENT

To effect time zone adjustment, special purpose crown 4 is pulled out, thereby placing setting lever 11 in the position shown in FIG. 2. Setting lever 11 is caused to rotate above pivot 10, the free arm 11B of the lever pushing slide plate 12 against the force of spring 13 and causing wheel 31 to engage wheel 33. At the same time, third wheel 19, which carries spring finger 20A, is shifted so as to bring this finger out of engagement with teeth 25 of the calendar ring.

A rotation of stem 5 by crown 4, causes wheel 8 on the stem to drive wheels 16, 17, 19 and 29 as well as the drive device constituted by section 30 and bar 32. Consequently, the star wheel 35 is rotated until the end of a spring 38 jumps into the next gap. Of course, rotation of star wheel 31 and hence of hand 36 may be carried out in either direction and the local time hour hand 36 may be shifted incrementally by one or several hours according to the existing time difference when traveling from one time zone to another.

The moment the end of spring 38 jumps into the gap of star wheel 35, wheel 33 is caused to leap forward. This sudden rotation however does not affect the setting mechanism, for there exists a large play between drive section 30 and the end of bar 32.

While there has been shown a preferred embodiment of the invention, it is to be understood that many changes may be made therein without departing from its basic concepts.

I claim:

1. A calendar watch provided with an hour hand, an inside-toothed calendar ring, motor means to operate said hour hand and said ring, and manually operated selective means for incrementally adjusting said hour hand to a particular time zone or for setting said ring, said selective means comprising:

A. a crown secured to a stem having a stem wheel mounted thereon and rotatable therewith, said stem being axially movable to a first position in which said hour hand is adjustable by rotation of said stem and to a second position in which said calendar ring is settable by rotation of said stem,

B. a slide plate pivoted on a fixed axis having a first gear wheel rotatably mounted thereon, said first gear wheel meshing with said stem wheel in both said first and second positions of said stem, said slide plate carrying both gear-wheel-drive means to advance said calendar ring and a drive wheel meshing with said gear-wheel-drive means to adjust said hour hand, and

C. means operatively coupling said stem to said slide plate whereby when said stem is moved to said first position said plate is caused to slide to a position in which said drive wheel engages a second gear wheel so coupled to

said hour hand that its rotation results in an incremental adjustment thereof without interrupting its normal drive, and when said stem is moved to said second position said plate is caused to slide to a position in which said gear-wheel-drive means engages said calendar ring to effect setting thereof.

2. A calendar watch as set forth in claim 1, wherein said means operatively coupling said stem to said slide plate is constituted by a double-arm lever the free end of one arm cooperating with said stem, the free end of the other arm cooperating with the slide plate, such that when pulling out the stem, the slide plate is swung about said fixed axis against the force of a spring in a direction toward the center of the watch movement, whereby said gear-wheel-drive means is disengaged from said calendar ring and said drive wheel is brought into mesh with said second gear wheel in order to adjust said hour hand.

3. A watch as set forth in claim 2, wherein said gear-wheel-drive means includes a third gear wheel mounted on an axle which carries a driving member cooperating with the inside toothing of said calendar ring.

4. A calendar watch as set forth in claim 3, wherein said third gear wheel is positioned on one side of said slide plate and the axle on which said third gear wheel is mounted passes through said plate and is connected to a fourth gear wheel which is positioned on the other side of said plate and carries said driving member, said fourth gear wheel meshing with said drive wheel.

5. A watch as set forth in claim 4, wherein said driving member for adjusting said calendar ring is constituted by a flat spring having a free end which pushes against a stop pin when said member acts to move said calendar ring, whereas the free end is lifted by the teeth of said calendar ring and jumps over them when said calendar ring is advanced automatically in normal operation of the drive means therefor.