United States Patent

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[54] CALENDAR DAY AND DATE WATCH

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[52] **U.S. Cl.** **58/58,** 58/5

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

[58] **Field of Search** 58/4, 5, 58, 59

[56] **References Cited**

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[57] **ABSTRACT**

In a calendar watch, a day and date drive and dial indicator stepping mechanism including a pair of rotatably driven cams, the cams being geared to revolve at relatively different rates, one of the cams rotating at the rate of one revolution per day and operable to advance a day-indicator dial one step each day, and the second of the cams rotating at a rate of *n* revolutions per day, *n* being an integer greater than one, the second cam being rotatable about a shaft slidably engaged in a guide groove, means being provided to shift the second cam for periodic engagement with and to advance a date-indicating calendar ring one step for each *n* revolutions of the cam, whereby very rapid date and day setting and correction are rendered feasible.

5 Claims, 2 Drawing Figures

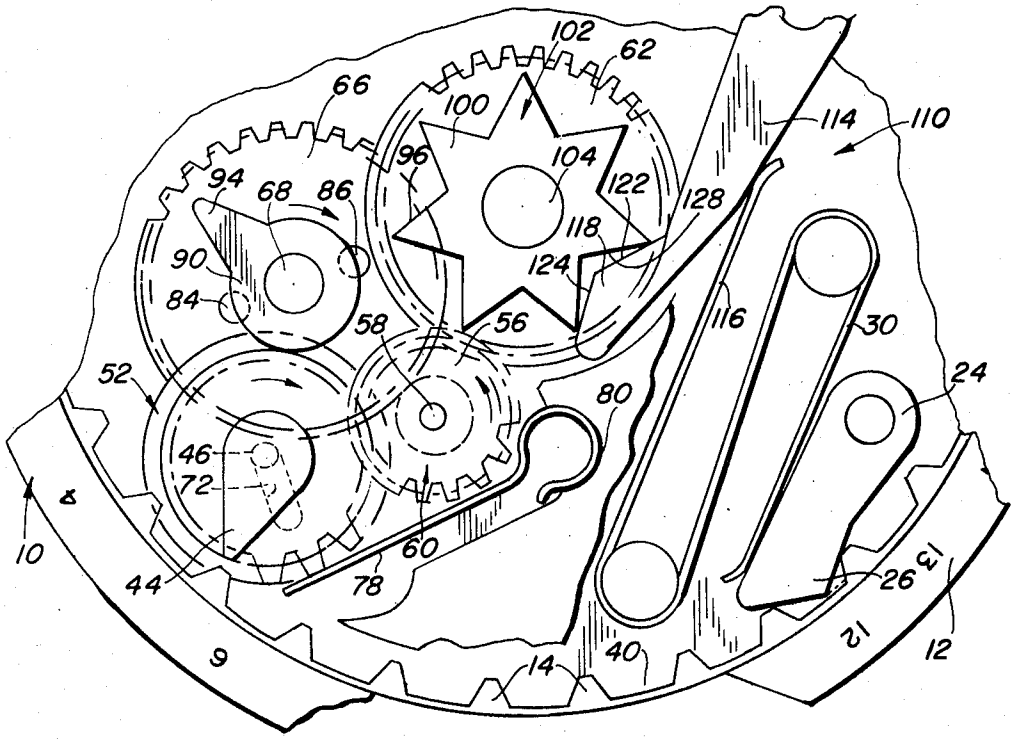


FIG 1

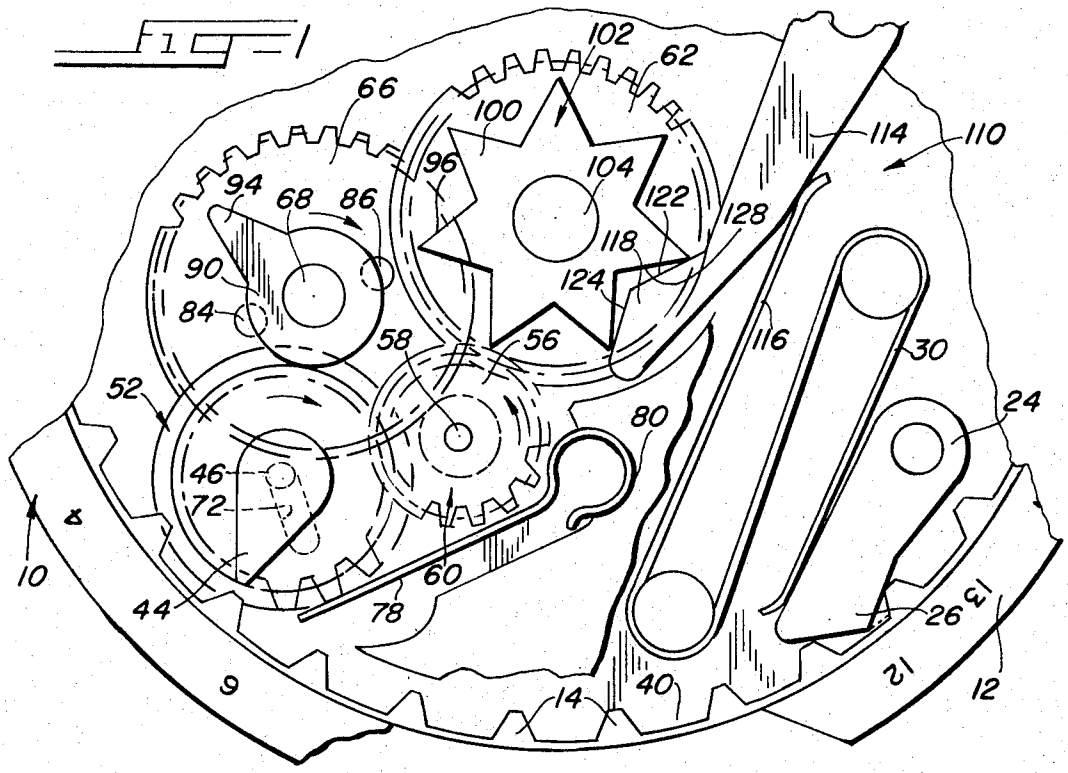
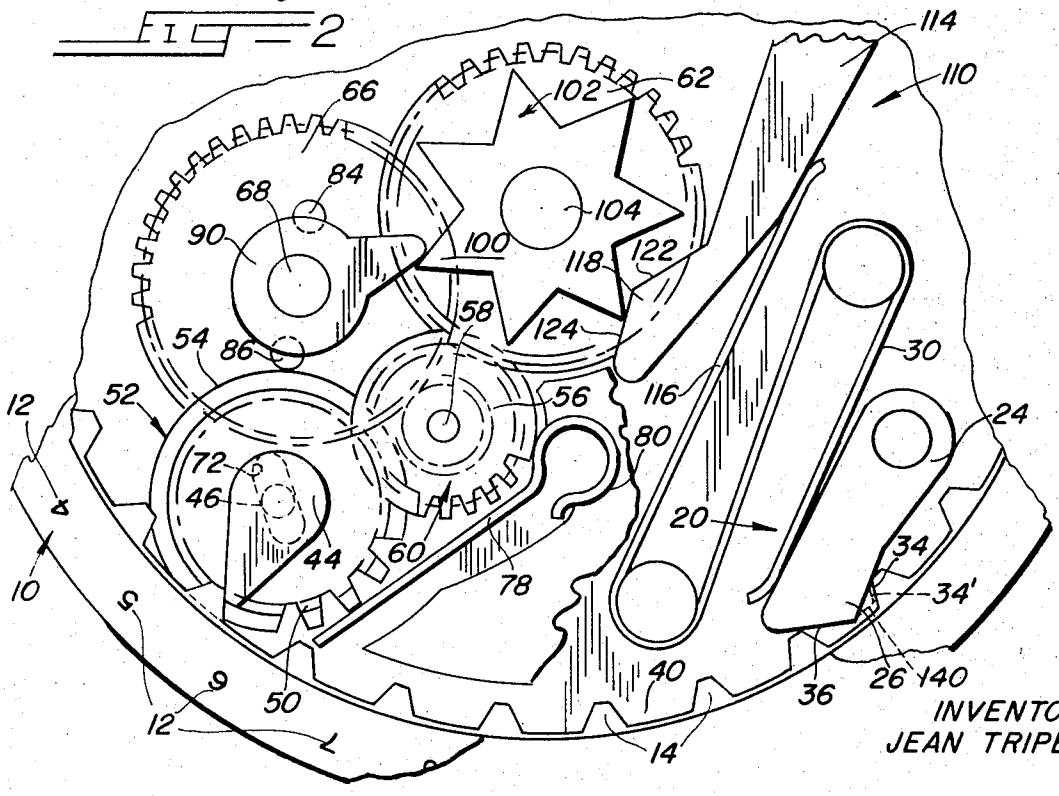


FIG 2



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CALENDAR DAY AND DATE WATCH

This invention relates generally to improvements in timepieces such as clocks, watches, and similar timekeeping instruments. More particularly, the invention is directed to improvements in clocks, watches, and the like by means of which more rapid and more convenient shifting, resetting, and correction of day and date indicator means is effected. A related important feature of the present invention is improved means by which the periodic, automatic shifting of date and day indicating dials is rendered precise, positive, and sharp.

A principal object of the present invention is to provide in a timepiece automatic means operative to effect a periodic shifting of day and date indicia means.

Another object of the invention is to provide in a timepiece, including date and day indicia means, an improved mechanism ensuring that the shift of the day and date indicating means each 24-hour period is for a fill or complete incremental step.

A related object of the invention is to provide in a timepiece, which includes day and date indicia means, day and date indicia drive means operating in conjunction with respective jumper and detent assemblies to effect a delayed, precise, and sharp shifting of the day and date indicator means at predetermined instances each 24-hour period.

Yet another object of the invention is to provide in a timepiece which includes day and date indicating mechanisms which obviate gradual shifting of the indicator means as contrasted with sharp, substantially instantaneous shifts.

A related object of the invention is to provide in a timepiece which includes day and date indicating means a spring loaded drive assembly precluding mechanical slack and free, uncontrolled movement of date and day indicia carrying means.

A general object of the invention is to effect the day and date shifting through the drive medium of the clock mechanism itself, without any major alteration in the watch movement.

An important feature of the invention is that the day indicator shifting means and the date indicator shifting means rotate at different rates, although the shift of each of these indicator means occurs once each 24 hour period.

Other and further objects, advantages, and features of the invention will become apparent from a reading of the following specification taken in conjunction with the drawing in which:

FIG. 1 is a face view of a timepiece with the fixed, windowed dial removed to illustrate, schematically, one form of the day and date indicating shifting mechanism of the invention; and

FIG. 2 is a face view similar to FIG. 1 and illustrating a second position of the day and date advancing cam of the invention.

The aims and objects of the invention are accomplished by providing, in a day and date indicating watch, an internally serrated calendar crown subject to the action of a spring-biased jumper and advancing one incremental step at a time every 24-hour period, the advancing resulting from the action of a unique mechanical assembly which includes a rotating cam supported on a shaft which travels in a guide groove in the platen of the watch. Cooperating means are provided which bear upon the cam assembly to displace

that assembly periodically into meshing engagement with the serrated calendar crown to advance the crown incrementally. Concurrently, a second cam advances a day star. Unexpected and highly desirable advantages are achieved by rotating the first cam at a speed different from that of the second cam, as will be more fully explained below.

The illustrative example provided in the drawing shows one form of means for effecting the incremental shift of the calendar crown and the day star, automatically. The timepiece itself contains clockwork mechanism of the usual type well known in the art. Accordingly, the mechanism itself is not illustrated. The clockwork mechanism may be either mechanically or electrically operated, a mechanically operated mechanism being indicated more or less diagrammatically, as its particular form does not constitute an essential part of the invention and needs no description here beyond an indication of the functional linkage.

Referring more particularly to the drawing, there is shown in FIG. 1 a calendar crown **10** carrying on its top surface date indicating means **12** in an annular array. The date indicating means comprise the numbers 1–31, these numbers appearing successively and being viewed through a window formed in the watch dial (not shown), all as is well known in the relevant art. The collar-like or ring-like calendar crown **10** is integrally formed with inwardly directed teeth, serrations, or cogs **14**, the arcuate spacings of which are correlated with the positions of the date indicating numbers **12**, so that, upon each incremental shift of the calendar crown, the next numerical date indicator appears in the window in the watch face. The calendar crown **10** is subjected to the action of a jumper or detent assembly **20** which is effective to ensure precise, step-wise, incremental advancement of the calendar crown at 24-hour intervals. The detent assembly **20** includes a pivotally mounted pawl **24** which carries an integral tongue **26**, the tongue being resiliently urged into engagement with the teeth or cogs **14** of the calendar crown **10** by means of a spring **30**. In the preferred embodiment of the invention illustrated, the tongue **26** is provided with angled or sloping faces or inclines **34** and **36** which project into the interdental space **40** between adjacent teeth and bear against edge portions of the teeth to retain the calendar crown **10** fixed and stable against inadvertent shifting or movement and to ensure positive mechanical action.

The calendar crown **10** is advanced one step every 24-hours under the action of a cam **44** rotatably supported on a cam shaft **46**. In the particular embodiment of the invention illustrated, the cam **44** is carried by or secured mechanically to an intermediate wheel or gear wheel **50**, the latter being secured, in turn, to and being coaxial with a disc **52** having a relatively smooth peripheral edge **54**. The gear wheel **50** engages with a pinion **56** which is fixedly connected to a serrated wheel or cog wheel **60**, the latter engaging the hour wheel **62**, so that the driven hour wheel imparts rotary motion to the cam **44**. The cog wheel **60** thus functions as the part of a simple gear, and the relation of the diameters of the hour wheel and the intermediate gear wheel **50** is, in the example illustrated, 3:2 so that the intermediate gear wheel **50** rotates at the rate of three revolutions per day. The pinon **56** also engages a

geared or serrated wheel **66** pivotally carried on a shaft **68**. The gear ratios between the hour wheel **62**, the mobile assembly **56**, **60** and the serrated wheel **66** are so selected that the wheel **66** completes precisely one revolution per day.

An important feature of the instant invention is the manner in which the date advancing cam **44** functions. That is, as indicated in the drawing, it undergoes not only rotational movement but sliding, reciprocal movement as well. As clearly shown in FIG. **1**, as illustrated, the cam shaft **46** is slidably disposed in a guide groove **72** formed in a platen or plate **74** of the watch body. In the position of the cam shown in FIG. **1**, the cam shaft **46** is at an upper extremity of the groove **72**, the position assumed in response to spring pressure applied against the disc **52** by a spring **78**, the latter being secured in a housing **80** of the platen **74**.

The cam **44** is integrally formed with a digit, projection, or finger which, in the position of the cam shown in FIG. **1**, is radially clear of the teeth or cogs **14** of the calendar crown **10**. The manner in which the cam **44** is shifted to a position of interengagement with the cogs **14** is described below.

The operation of the day-shifting mechanism of the watch will be evident upon a consideration of FIGS. **1** and **2**. Referring first to FIG. **1**, the serrated wheel or gear wheel **66** carries on its upper surface two pegs or pins **84** and **86**, and a day-shifting or advancing cam **90** is rotatably supported on the shaft **68** for rotation therewith. The cam **90** is integrally formed with a digit, projection, or finger **94** which, upon rotation of the cam **94** in a clockwise direction comes into contact, as indicated in FIG. **2**, with a face **96** of one of the spurs or projections **100** of a day star **102** to advance the star one incremental step for each rotation of the cam **90** or one incremental step each 24-hour period to establish a daily day indication on the dial of the watch. In the preferred embodiment of the mechanism illustrated, the day star **102** is carried on the same shaft **104** about which the hour wheel **62** revolves. The star **102** itself is formed with seven peripheral indentations and a detent assembly **110** consisting of a pawl **114** and a spring **116** ensures precise, stepwise, incremental advancement of the day star at 24-hour intervals. The pawl **114** of the detent assembly **110** includes an integral tongue **118** provided with angled or sloping faces **122** and **124** which project into the interdental space **128** between adjacent spurs **100** of the star **102**, bearing against the spurs to retain the star fixed and stable against inadvertent shifting movement and to ensure positive mechanical action. In the embodiment of the structure illustrated, the spring **116** is formed integrally with the spring **30**. The day star **102** has a disc, not shown, on which the names of the days of the week are imprinted so as to appear across a window in the fixed watch dial.

When the watch is in operation, the hour wheel **62** causes the cam **44** to rotate clockwise at a speed of three revolutions per day. The previously described arrangement in which the cam shaft **46** is displaceable within the guide groove **72** and in which the cam assembly is displaced in the groove **72** by means of the pins **84** and **86** establishes a system in which the calendar crown moves, not an incremental step each 8 hours, but only one step every 24 hours. A detailed description of the mode in which the above-described operation is achieved is set forth in the paragraphs below.

FIG. **1** depicts the relationship between the various component elements of the mechanism in the rest or reposing position between two jumps or forward steps of the calendar crown **10**. Under the biasing action of the recoil spring **78**, the disc **54** and gear wheel **50**, together with the cam **44** and shaft **46** are urged upwardly to a limit position in which the shaft **46** occupies the upper extremity of the groove **72**. Under the spacial disposition described, the cam **44** executed an orbit such that the digit or projection **94** rotates clear of the teeth or cogs **14** of the calendar crown **10**. However, as the wheel **66** and the pins **84** and **86** carried thereby rotate in a clockwise direction, as shown in FIG. **1**, the pin **86** comes into positive contact with and bears against the disc **52** urging the disc and its associated cam **44** and cam shaft **46** downwardly along the groove **72** to a position in which the digit or finger **94** of the cam **44** radially overlaps and engages the cogs **14** of the calendar crown **10**, the digit **94** encroaching into the interdental space **40** between successive cogs **14**.

FIG. **2** illustrates schematically the position of the various component active parts of the calendar crown drive system at the moment when the cam **44** comes into contact with a tooth **14** of the crown **10**. The gear wheel **50** continues to rotate as the cam **44** entrains the calendar crown **10**, and the pawl **24** is raised. Cam shaft **46** of cam **44** moves downwardly in the groove **72** against the action of spring **78**, and the direction of the groove **72** is so selected that during this movement the tip of cam **44** slides against the flank of the tooth **14** of the calendar crown **10**, penetrating further and further into the interdental gap formed between adjacent cogs **14**. Finally, at a given instant, the tip of the cam **44** leaves the tooth **14** and the spring-stressed pawl **26** completes the movement of the calendar crown one incremental step.

Simultaneously with the stepped advance of the calendar crown **10**, that is at midnight, the day star **102** is advanced under the action of the cam **90** carried by the cog wheel **66**. It should be noted that the cam **90** commences to act on the day star **102** at a point in time before the date cam **44** comes into contact with the cog of the calendar crown **10**. This fact is important for setting the date, as will be explained more fully below.

As the watch continues to operate, the pin or peg **86** moves away from or out of contact with the disc **52** and will not again contact that disc until 24-hours has elapsed. The second pin **84** also acts on the disc **52** and pushes it downwardly every 24-hours. This fact is of no significance with respect to advancing the date indication since at the moment when pin **84** comes into contact with disc **52**, the tip of cam **44** is not opposite the serrations or cogs **14** of the calendar crown **10**. The purpose of the pin **84** is principally to separate the cams **44** and **90** from each other at a moment when they might otherwise contact each other, since they are in the same plane.

According to the variant of the pawl tongue **26** shown in dotted lines in FIG. **2**, the jumper or pawl **24** may be modified to provide a flat portion **140** between the slopes **34** and **36**, the resulting slope **34'** then being stiffer than the slope **34**. In the alternative embodiment described, the jump of calendar crown **10** would be

made substantially instantaneously, as the slope **34'** would momentarily imobilize the calendar crown **10**, the latter being released at that moment when the shaft **46** of cam **44** reaches the end of the groove **72**, to effect a sudden, one step advance under the action of the spring **78**.

The fact that the intermediate wheel **50** and its associated cam **44** rotate at the rate of three revolutions per day permits a very rapid date setting. Indeed, it suffices to turn the hands of the timepiece back after midnight only about one hour in order to effectuate a jump of the calendar crown **10** as the hands are again moved forward to midnight. This back and forth movement allows for a quick correction of the indication of the date. If the hands are moved back from midnight about 3 hours, cam **90** is placed behind the corresponding tooth or spur **100** of the day star **102**, so that, when the hands are moved forward to midnight a jump of the date setting calendar crown **10** and of the day indicating star **102** are accomplished. As a consequence of the mechanical structures and intercooperation described above, depending upon one's wishes to bring up-to-date the calendar alone or the calendar and the day, it suffices to apply to the clock hands a back and forth movement of appropriate amplitude. Practically, if one admits that the watch has been stopped, one will first correct the day of the week by executing a back and forth movement of three hours, disregarding the date. Then the date is corrected by a back and forth movement of small amplitude. At the end of those months having fewer than 31 days, it suffices to apply to the clock hands a back and forth movement of small amplitude. The day of the week requires no correction.

It will be appreciated that the specific embodiment of the invention illustrated and described is merely exemplary of the invention and that numerous variations may be made without departing from either the spirit or scope of the invention. For example, instead of having the intermediate gear or wheel **50** and the cam **44** rotate at the rate of three revolutions per day, another speed, for example two or four revolutions per day may be selected. However, the preferred speed of three revolutions per day appears to be most favorable, and does not require a complicated mechanism.

What is claimed is:

1. In a day and date indicating calendar watch including a dial, a clock mechanism, a ring-toothed, rotatably-supported calendar crown carrying date-indicating means in an annular array, a rotatable star wheel carrying day-indicating means, and advancement means mechanically coupled to said crown and to said star wheel and operative to shift each said crown and said star wheel rotationally in incremental steps at 24 hour intervals,

the improvement wherein said advancement means comprises:

first cam means and means coupling said first cam means to the clock mechanism for rotatably driving said first cam means at a rate of one revolution per day, said first cam means periodically engaging and advancing said star wheel in incremental steps at 24 hour intervals to provide correct day indications on the dial of said watch,

a plate-like platen affixed to said watch and having a shaft guide-groove formed therein,

second cam means including a transversely disposed shaft constituting a rotational axis of said second cam means, said shaft being supported for linear travel in said guide groove formed in said plate-like platen,

gear means and means coupling said gear means to said second cam means for rotating said cam means about its axis at a rate of *n* revolutions per day, *n* being an integer greater than one,

means for periodically, reciprocally shifting the axis of said second cam means along said guide groove between a rest p position wherein said second cam means is free from engagement with teeth of said ring-toothed calendar crown and a displaced position wherein said second cam means stressingly engages a tooth of said ring-toothed calendar crown to urge said crown forward annularly, thereby to advance crown-carried said date-indicating means one incremental step for each *n* revolutions of said second cam means to provide sequential date indications on the dial of said watch.

2. The structure as set forth in claim **1** and further comprising disc means coaxial with said second cam means and affixed thereto for rotation therewith, and spring means stressingly and resiliently engaging said disc means at a periphery thereof and biasing said second cam means toward said rest position within said guide groove of said platen.

3. The structure as set forth in claim **1** wherein said means for shifting said second cam means from said rest position to said displaced position within said guide groove comprises pin means, and means supporting said pin means for revolution with said first cam means, disc means affixed to said second cam means and coaxial with said second cam for rotation therewith, said pin means executing an orbit in which said pin means periodically bears against said disc means in abutting relationship and shifts said second cam means toward said displaced position and into meshing engagement with said ring-toothed calendar crown to advance said crown one incremental step.

4. The structure as set forth in claim **1** wherein the integers *n* is three, whereby said second cam means rotates at a rate of three revolutions per day.

5. The structure as set forth in claim **3** wherein engagement between said second cam means and said calendar crown occurs only upon contact between said pin means and said disc means, said contact occurring once for every *n* revolutions of said second cam means.

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