Jan. 14, 1969 W. O. BENNETT ET AL 3,421,310

ACTUATING MECHANISM FOR TIMEPIECE DATE INDICATOR

Filed Oct. 5, 1966 Sheet 1 of 3

Fig. 1.

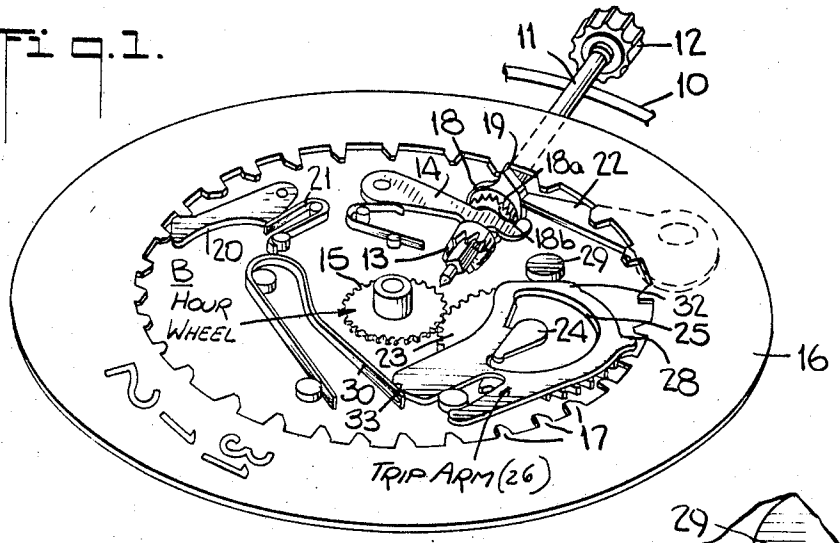


Fig. 2.

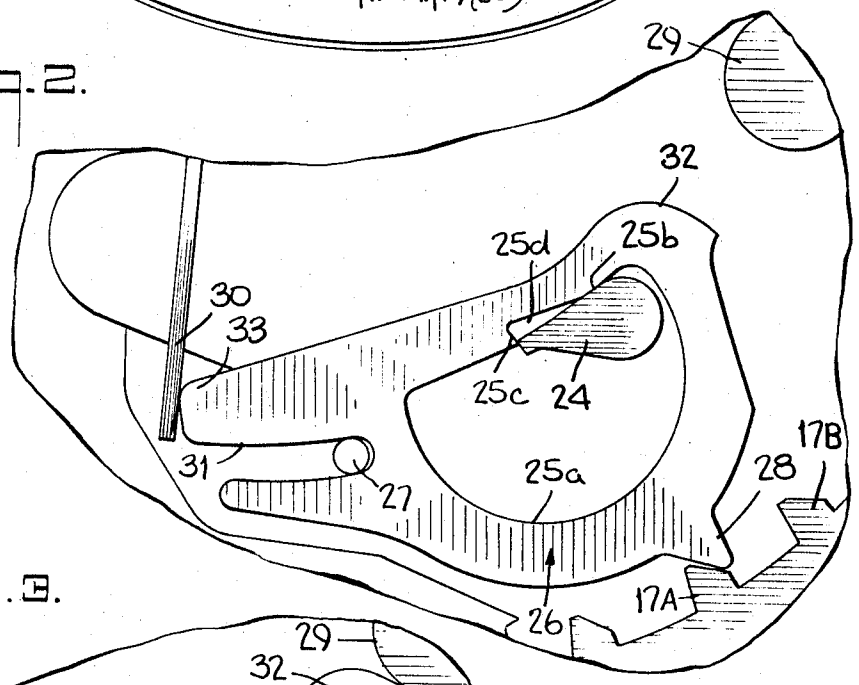
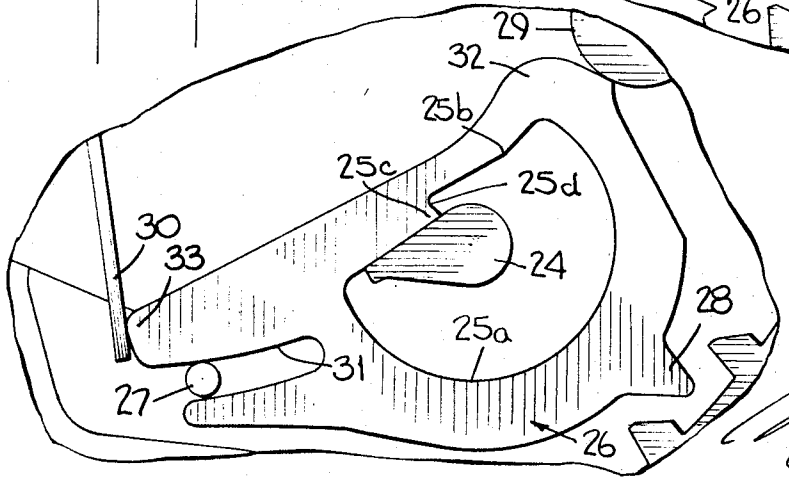


Fig. 3.



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ACTUATING MECHANISM FOR TIMEPIECE DATE INDICATOR

Filed Oct. 5, 1966 Sheet 2 of 3

Fig. 4.

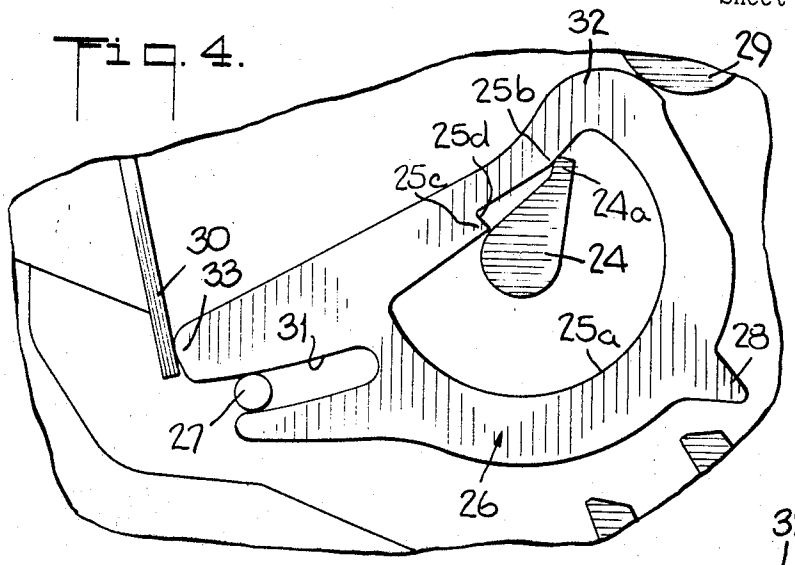


Fig. 5.

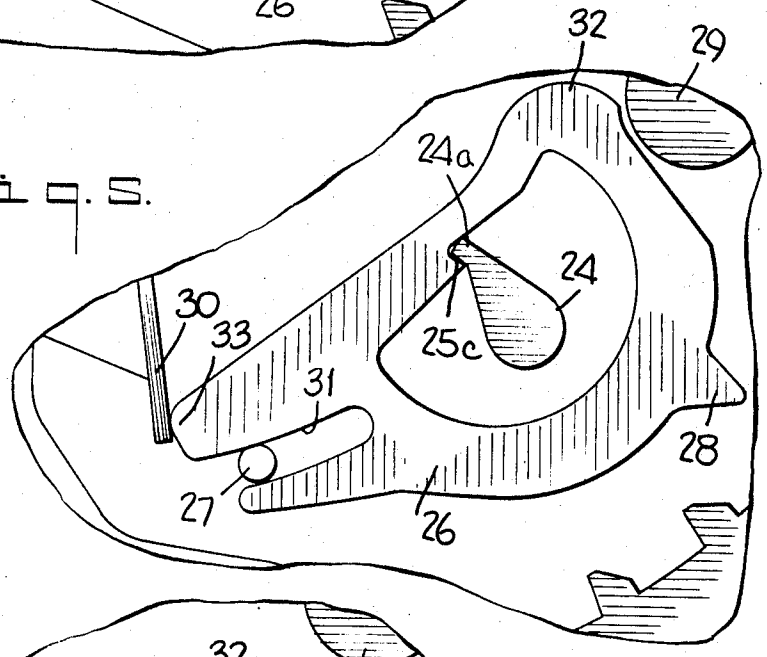
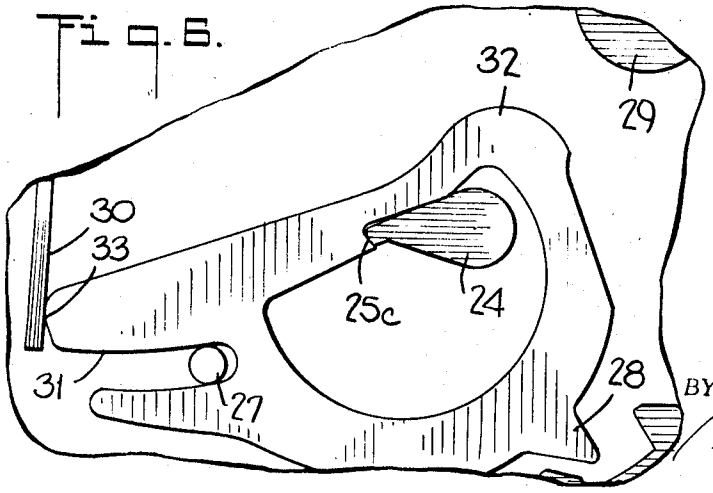


Fig. 6.



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ACTUATING MECHANISM FOR TIMEPIECE DATE INDICATOR

Filed Oct. 5, 1966 Sheet 3 of 3

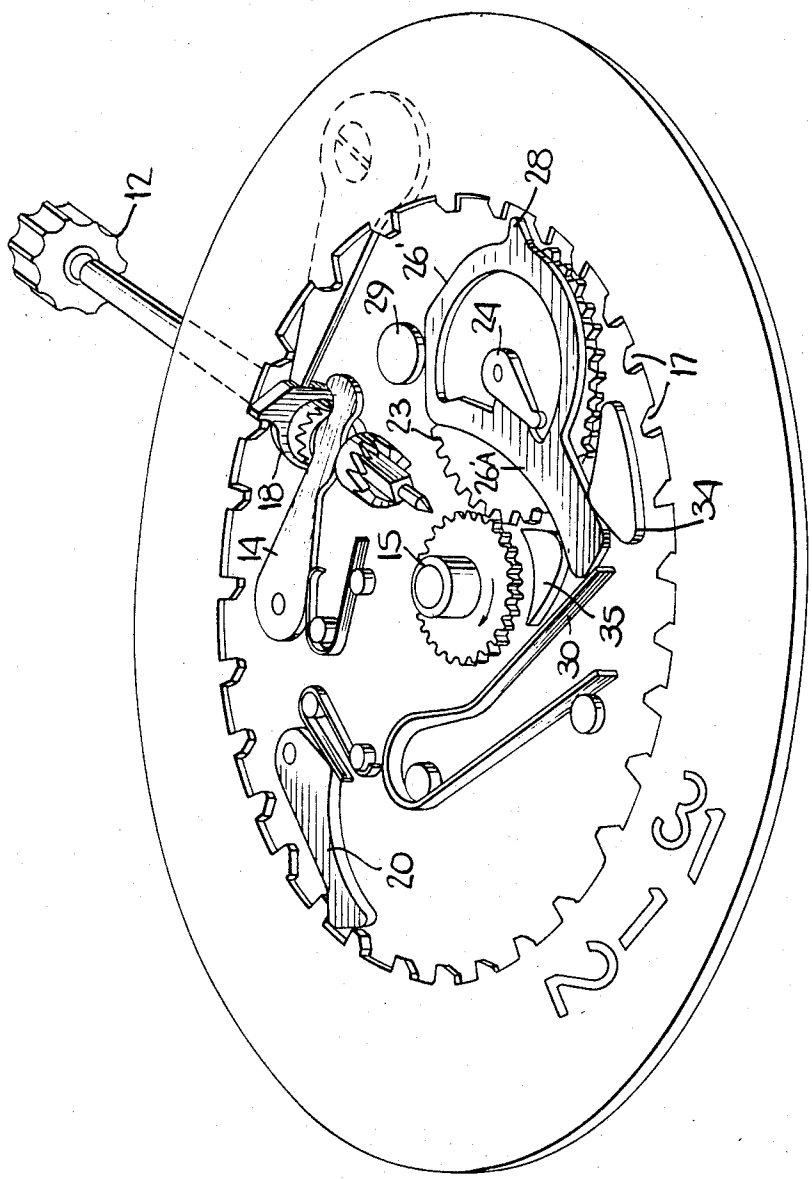

Fig. 7.

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3,421,310

ACTUATING MECHANISM FOR TIMEPIECE DATE INDICATOR

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Continuation-in-part of application Ser. No. 538,840, Mar. 30, 1966. This application Oct. 5, 1966, Ser. No. 598,543

U.S. Cl. 58—58 3 Claims
Int. Cl. G04b *19/24*

ABSTRACT OF THE DISCLOSURE

A calendar timepiece for indicating the days of the month as well as the time, and including a rotatable date ring having a series of inner teeth thereon, one for each day of the month. An automatic trigger mechanism is provided to advance the date ring only one tooth per twenty-four hour period, the mechanism being operated by a driven wheel which undergoes a full revolution in the course of this period. The mechanism comprises a slidably-mounted member having an opening therein which is contoured to include a projection, the member having a nose extending outwardly therefrom, and being engaged at one end by a spring which urges it in a slide path directing the nose toward the teeth of the ring. Operatively coupled to the driven wheel is a trip finger which rotates within the opening and, in the course of rotation, engages the projection to slide the trip member against the action of the spring in an opposite direction until the member is cocked, the finger thereafter releasing the member to cause the nose thereof to reach a point at which it strikes a tooth on the ring to advance same. A bumper is disposed in the slide path to limit the displacement of the released member and to prevent rotation thereof, whereby the nose remains momentarily at the point to intercept the next tooth in the ring, thereby preventing an advance thereof in excess of one tooth.

This invention relates generally to actuating mechanisms for calendar timepieces, and more particularly to a mechanism including a manually-operated setting device to advance a date indicator without disturbing the time indications of the timepiece, and a triggering arrangement whose operation in no way interferes with the setting device, for automatically indexing the date indicator once a day. This application is a continuation-in-part of our copending application S.N. 538,840 filed Mar. 30, 1966.

In a conventional calendar watch or clock, it is known to include a rotatable date indicator ring having numbers 1 to 31 imprinted thereon in a circular path, one date at a time being visible through a window in the dial face. This ring is driven from a mechanism operated through the hour wheel of the timepiece to cause the ring to jump one date per twenty-four hour interval.

Since some months of the year have less than thirty-one days, it is necessary at the end of such months to advance the ring in order to skip over the excess number or numbers, thereby presenting number 1 on the first day of the next month. Normally this correction is effected by means of the setting crown which is first pulled out to engage a setting wheel for the time-indicating hands. The crown is then turned to actuate the date advancing mechanism.

Procedures for accomplishing date indication correction may vary, depending on the particular design of the calendar mechanism system. However, conventional systems require disturbing the time-of-day indication to change the date indication. Consequently, after the calendar correction is made, it then becomes necessary to reset the time-indicating hands.

Accordingly, it is the primary object of this invention to provide an actuating mechanism for a date indicator in a calendar timepiece, which mechanism acts automatically to advance the indicator one date per twenty-four hours, and is also capable of being manually corrected without upsetting the positions of the time-indicating hands.

It is also an object of the invention to provide an actuating mechanism of the above-noted type which operates reliably, and is of simple and rugged design, the mechanism entailing relatively few components which are disposed adjacent the inner toothing of the date indicator ring, the mechanism functioning each day at approximately twelve midnight instantaneously to advance the ring one date.

A significant feature of the invention is that the manually-operated setting device of the actuating mechanism is operatively coupled to the setting crown of the timepiece, correction being effected without the need to pull out the crown or otherwise shift the axial position of the setting stem. To advance the date manually, the setting crown, while in its normal or "in" position, is turned in the clockwise direction until the proper date is indicated.

Briefly stated, these objects are accomplished by means of a date-indicating ring having an inner toothing which is engaged by a corrector finger projecting from a collar mounted on the crown stem of the timepiece, such that when the crown is at its "in" or running position and is manually turned, the ring is caused to advance one date for each revolution of the crown, without disturbing the time-indicating hands. Automatic daily actuation of the ring is effected by a trip arm which is slidable against the action of a spring from a cocked or charged position to a discharged position, the trip arm having a nose thereon which when the arm is triggered is adapted to engage a tooth on the ring, thereby to index the ring.

A trip wheel, which intermeshes with the hour wheel of the timepiece and makes one full revolution per twenty-four hour period, carries a trip finger which cyclically rotates therewith within a contoured opening formed in the trip arm, the finger acting during its rotary cycle to cause said arm to slide away from its discharged position toward its cocked position, in the course of which movement the nose is withdrawn from the toothing on the ring. At midnight of each day the trip finger releases the spring-biased trip arm, whereby the arm is abruptly urged toward the discharged position and the nose thereon makes contact with a tooth in the ring to advance the ring one step.

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

FIG. 1 is a perspective view showing the essential components of an actuating mechanism in accordance with the invention;

FIG. 2 is a plan view showing the cocked position of the trigger device of the actuating mechanism at about 11:59 p.m., when it is ready to trip;

FIG. 3 is a plan view showing the trigger device at midnight shortly after it has tripped, the trigger device being in its discharged position;

FIG. 4 shows in plan view the position of the trigger device at about 3:00 p.m.;

FIG. 5 shows in plan view the position of the trigger device at about 7:00 p.m.;

FIG. 6 shows in plan view the position of the trigger device at about 11:00 p.m., and

FIG. 7 illustrated in perspective, a modification of the calendar actuating mechanism.

Structure of calendar actuating mechanism

The actuating mechanism in accordance with the invention is constituted by a trigger arrangement which automatically indexes the calendar ring once every twenty-four hours, and a manual setting device which operates independently of the trigger to advance the ring upon turning of the setting crown of the timepiece when the crown is in its running or "in" position.

The watchworks are contained in a casing **10** and the time-setting mechanism therefor includes a stem assembly having a stem **11** whose upper end extends through an opening in casing **10** and terminates in a crown **12**. The time-setting mechanism forms no part of the present invention; however, some of the parts thereof appear in the environment of the present invention, and these parts will therefore be described.

Mounted on a square section of the round stem **11** is clutch wheel **13**, which is free to slide but not to rotate thereon. Wheel **13** is caused by clutch lever **14**, which extends through an annular groove in the clutch wheel, to engage a setting wheel when the stem is fully retracted by its crown to the pull-out or time-setting position. The setting wheel (not shown) intermeshes with the minute wheel (not shown) of the timepiece such that when the crown is rotated with the stem retracted to the time-setting position, the minute wheel turns, thereby setting the minute and hour hands in the usual manner. The hour wheel **15** makes one revolution per twelve-hour period. Hour wheel **15** drives the automatic trigger device for actuating the calendar.

The date indicator is constituted by a flat ring **16** whose inner periphery has a series of thirty-one teeth **17** formed thereon, each tooth being associated with a date imprinted or inscribed on the face of the ring. Ring **16** is mounted for rotary motion on a base plate B within the casing below the dial plate, the dial plate having a window therein to expose a single date number at a time. Thus as the ring is advanced, the numbers 1 to 31 appear in sequence.

The manual setting device for the ring **16** is constituted by a collar **18** freely mounted on stem **11** and provided with a projecting finger **19** which is adapted to engage the teeth **17** on the ring to effect correction of its position. Collar **18** is provided with ratchet teeth **18***a* adapted to engage mating teeth **18***b* on the clutch wheel **13**, the toothed elements engaging each other only in the "in" position of the stem, and the ratchet teeth being so disposed that collar **18** is turned when stem **11** is rotated in the clockwise direction. The arrangement is such that should finger **19** happen to be in the path of a tooth **17** on the ring when automatic date advance takes place, in the manner to be described hereinafter, the finger will be kicked out of the way.

Turning the crown in the clockwise direction when the stem is in the "in" position causes the corrector finger **19** to engage one tooth for each full rotation of the stem, thereby advancing the ring one date at a time, the detented position of the date ring being maintained by a pivoted detent **20** which engages the teeth **17** of the ring and is urged thereagainst by a spring **21**. When the crown is pulled out, the clutch elements **18***a* and **18***b* are disengaged, since clutch wheel **18** is then caused to slide along stem **11** to engage the setting wheel. Hence rotation of the stem for purposes of setting the time-indicating hands cannot cause the manual setting device to advance the date indicator.

To resist free turning of the crown for a portion of each revolution, thereby preventing accidental advance of the date indication, a flat spring detent **22** is provided, the tip of this member engaging the corrector finger **19** and acting to prevent rotation of the stem until the spring force of this detent is overcome by the finger. Thus before finger **19** is permitted to engage a tooth on the calendar ring, it must first "snap" the detent spring **22**. This introduces a "hard turn" portion in the stem revolution. In practice, when setting the date, one stops turning the crown after reaching the proper date indication and before reaching the hard-turn portion of a revolution.

The automatic trigger arrangement for the calendar ring includes a trip wheel **23** which intermeshes with the hour wheel **15** of the timepiece and makes one full revolution per twenty-four hours. Mounted on top of the trip wheel **23** and rotating therewith is a trip finger **24** which operates in the counterclockwise direction within an opening **25** formed within the upper portion of trip arm **26**. As best seen in FIGS. 2 to 6, the opening **25** has a generally semi-circular configuration, the contours of the opening relative to that of finger **24** therein being such that the finger never engages the circular wall portion **25***a* in the course of rotation but does make contact with a somewhat convex wall portion **25***b* and a projection **25***c*, a notch **25***d* being situated at the junction of the projection and the convex portion.

The lower portion of the trip arm has a slot **31** formed therein within which is received a guide **27**, the slot **31** extending to the lower edge of the arm. A nose **28** projects laterally from one side of the arm, which nose when the arm is tripped engages a tooth of the date ring to advance same.

A bumper **29** is secured to base plate B and makes contact with a cam portion **32** on the upper edge of the arm when the arm is in its triggered position. The trip arm **26** is slidable on the base plate B, the lower edge **33** thereof being engaged by a trip spring **30** which is arranged to urge the arm against bumper **29**, the position of the arm being caused to vary as trip finger **24** rotates.

As will be explained in greater detail in the section to follow, the position of the rotating trip finger is such, shortly before midnight, as to dispose the trip arm in its cocked position. A moment thereafter, the spring biased arm **26** is released by the finger shifts. The nose is thereby caused to engage and push a tooth on the ring to advance the ring one date, after which the arm which now abuts the bumper occupies its triggered position.

Operation of calendar actuating mechanism

Referring now to FIG. 2, there is shown the position of trip finger **24** in a position wherein the trip arm **26** urged against spring **30** is cocked and is just about to be triggered. This occurs shortly before midnight, say at 11:59 p.m., just before the date is to be changed. In this position, the tip of finger **24** is about to leave the edge of notch **25***d*.

The finger in notch **25***d* acts against the force of spring **30** to push trip arm **26** to its cocked position in which the trough of slot **31** engages guide pin **27**. Also in this position the arm is at its maximum displacement from bumper **29**. It will be noted that the nose **28** of trip arm **26** lies in the space between the ring teeth **17**A and **17**B, the nose being close to tooth **17**A.

When trip finger **24** rotates further in the counter-clockwise direction, it leaves notch **25***d*, as a consequence of which trip arm **26** is suddenly released, and the arm, under the action of spring **30**, slides abruptly toward bumper **29**. In doing so, nose **28** is caused to engage tooth **17**B on the ring to advance the ring one date number.

It is important to understand that the limit imposed by bumper **29** on the displacement of trip arm **26** could also be accomplished by closing in slot **31**, whereby the guide pin **27** would then prevent further movement of the trip arm. However, the bumper has another function which cannot be carried out by guide pin **27**, for when the trip arm **26** is triggered, the force of nose **28** on the particular calendar ring tooth engaged thereby may be so great as to cause the next tooth in the advancing ring to strike the rear of the nose. Should the guide pin **27** have been used to limit the arm movement rather than bumper **29**, this striking force would cause trip arm **26** to swing about guide pin **27** thereby removing nose **28** from the path of the calendar ring teeth, and permitting the ring to advance

an additional date. This action would of course be undesirable.

Bumper **29** therefore not only limits the displacement of the trip arm but it also functions to prevent a rotation thereof when the trip arm is triggered and a tooth on the calendar ring strikes the rear of nose **28**. Bumper **29** also performs another function, for when rotating finger **24** presses against the convex wall portion **25***b* of the opening and the cam portion **32** of the trip arm abuts the bumper, as will be described in greater detail in connection with FIG. 4, this causes the trip arm to slide against the action of spring **30** as well as to swing about guide pin **27**, whereby the sliding and rotating motions of the arm are concurrent.

The discharged condition of the trigger mechanism is shown in FIG. 3, where it will be seen tht the cam portion **32** of the trip arm now lies against bumper **29**, guide pin **27** now being near the mouth of slot **31**, the projection **25***c* in opening **25** being banked against the side of trip finger **24**. This is the posture assumed by the elements at twelve midnight.

Referring now to FIG. 4, there is shown the relative position of the various elements at about 3:00 p.m. The trip finger **24** has in the period running from 12 midnight to 3:00 p.m., traversed the semi-circular path adjacent the portion **25***a* of the opening, during which time trip arm **26** remains at its discharged position against bumper **29** until the convex portion **25***b* is engaged. As the trip finger pushes against this convex portion, it causes trip arm **26** to withdraw nose **28** from between the teeth on the ring. In this action, cam portion **32** of the arm riding against the bumper, causes the arm to slide against spring **30** while the arm at the same time is caused by the finger to swing about guide pin **27**, thereby retracting the nose.

When the tip **24***a* of trip finger **24** enters notch **25***d* at 7:00 p.m., as shown in FIG. 5, it pushes against projection **25***c* and causes trip arm **26** to slide away from the bumper, the sliding movement being guided by pin **27**. This continues until about 11:00 p.m., as shown in FIG. 6, wherein the trip arm now has reached its maximum displacement from the bumper and is cocked. Between 11:00 p.m. and 11:59 p.m., as shown in FIG. 2, the trip finger proceeds to move out of notch **25***d*, during which time the cocked position of the trip arm remains unchanged, until suddenly when the finger is free from the shoulder, the trip arm is abruptly released to advance the calendar ring in the manner described previously.

Modified calendar actuating mechanism

Referring now to FIG. 7, there is shown a modified calendar actuating mechanism which is identical in all respects to that shown in FIG. 1, except that guide pin **27** is omitted, and the lower portion of trip arm **26'** is not slotted but is formed into a tongue **26'A** which extends slidably between two cam-shaped guide members **34** and **35** which are spaced apart and secured to or integral with the base plate B to define a channel. The curvature of guide members **34** and **35** is such that the tongue **26'A** is not only free to slide back and forth, but can also assume a rocking angle with respect to the guide members when trip finger **24** rotates. The operation of trip arm **26'** in its relation to bumper **29** and the behavior of the actuating mechanism are the same as that disclosed previously. However, the trip arm is of simplest design and of reduced weight, thereby minimizing the loading on the timing mechanism.

What we claim is:

1. In a calendar timepiece having a driven wheel which makes one revolution in the course of each twenty-four hour period and a rotatable date ring having a series of inner teeth thereon, one for each day of the month; an automatic trigger mechanism adapted to advance the date ring only one tooth per twenty-four hour period, said mechanism comprising:

(A) a slidably-mounted trip member having an opening which is contoured to include a projection, said member having a nose extending outwardly therefrom,

(B) a spring engaging one end of the member and urging same in a slide path directing the nose toward the teeth of said ring,

(C) a trip finger operatively coupled to said wheel and rotating within said opening, said finger in the course of rotation engaging said projection to slide said member against the action of the spring in an opposite direction until the member is cocked, the moving finger thereafter releasing said member to cause the nose thereon to reach a point at which it strikes a tooth in said ring to advance same, and

(D) a bumper disposed in the slide path of said member to limit its displacement upon its release and to prevent rotation thereof, whereby said nose remains momentarily at said point to intercept the next tooth in said ring to prevent an advance thereof in excess of one tooth.

2. In a timepiece as set forth in claim **1**, wherein said trip member at said one end has a slot therein within which is received a guide pin to guide the sliding movement of the arm.

3. In a timepiece as set forth in claim **1**, wherein said trip member at one end has a tongue which is slidably received within a channel formed by a pair of cam-shaped elements whose curvature is such as to guide said tongue as the arm slides.

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