Jan. 14, 1969 W. O. BENNETT ETAL 3,421,311

ACTUATING MECHANISM FOR TIMEPIECE DATE INDICATOR

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Fig. 1.

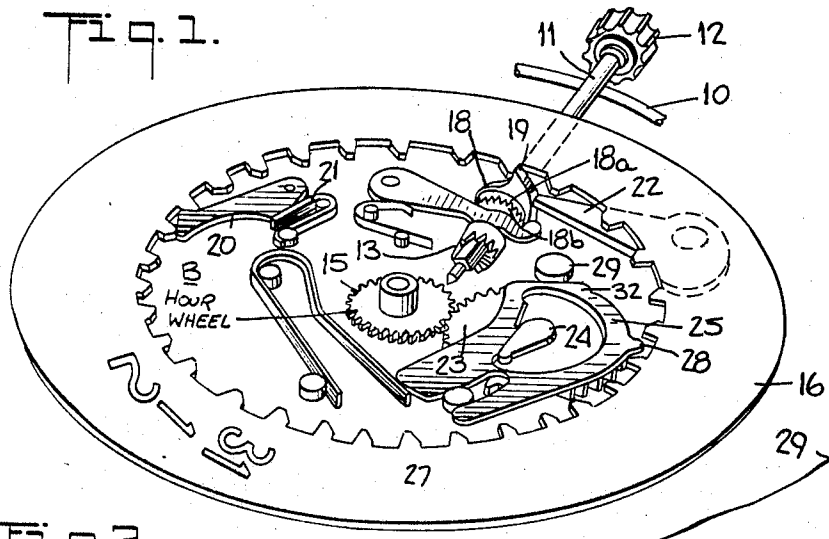


Fig. 2.

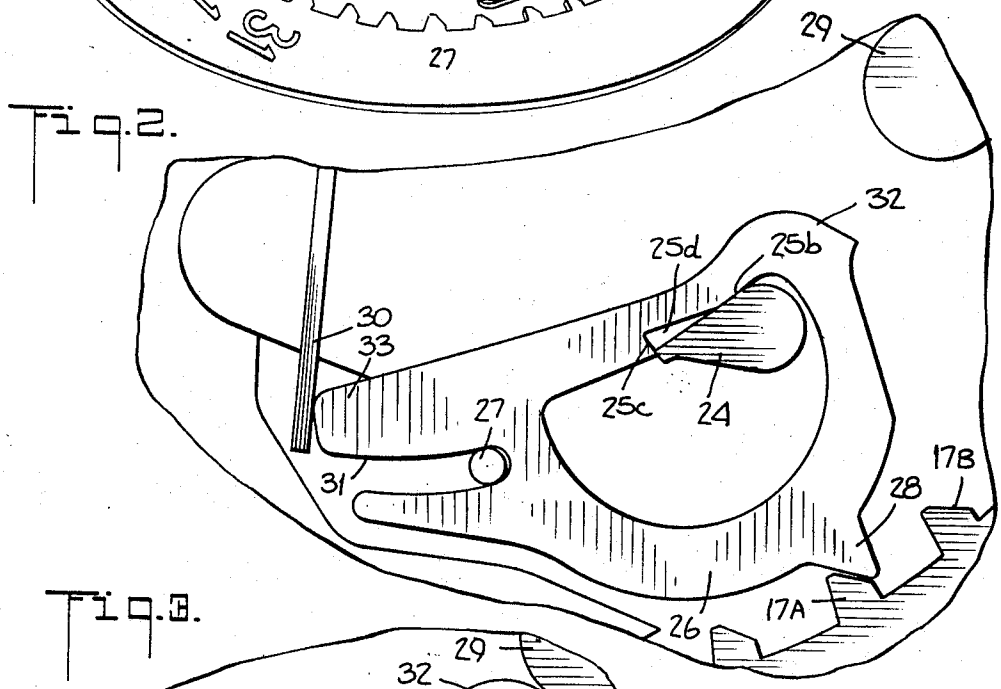
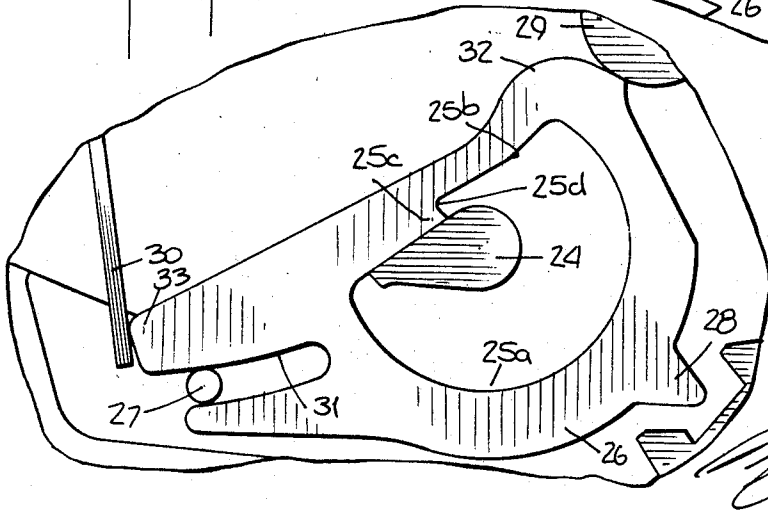


Fig. 3.



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ACTUATING MECHANISM FOR TIMEPIECE DATE INDICATOR

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Fig. 4.

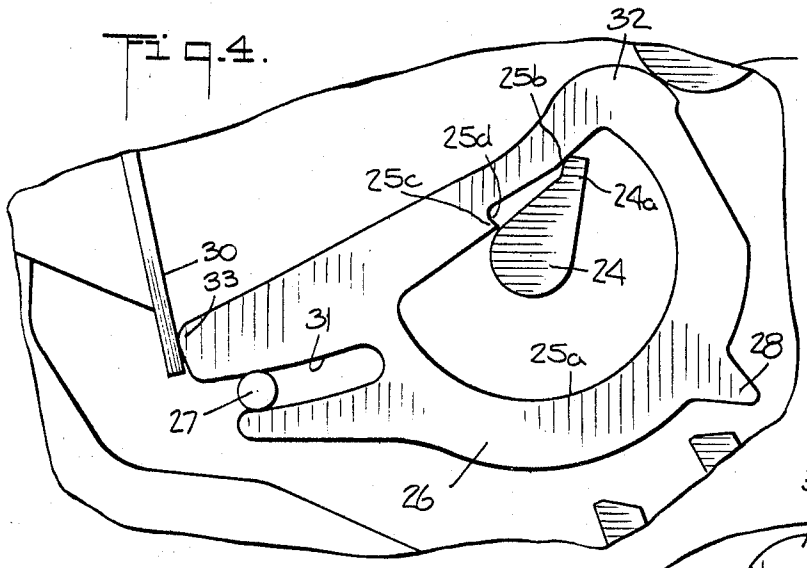


Fig. 5.

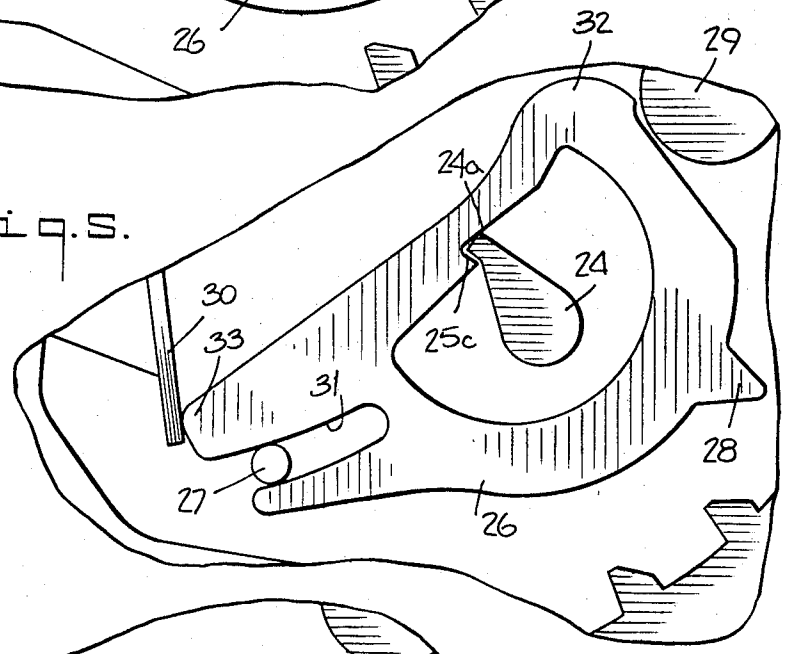
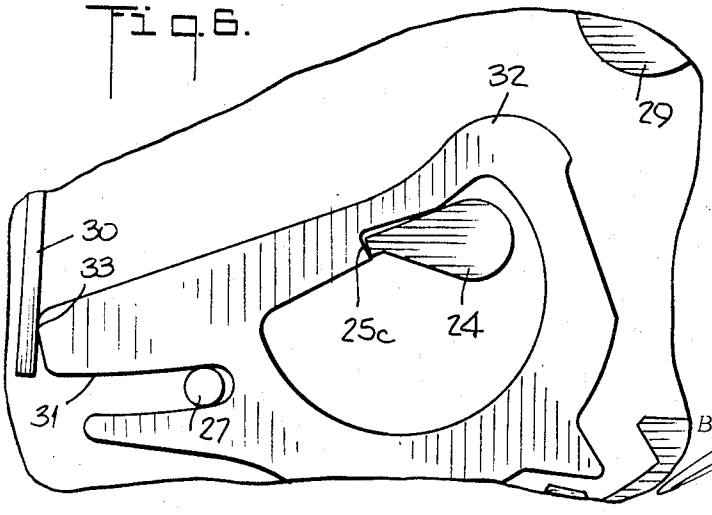


Fig. 6.



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ACTUATING MECHANISM FOR TIMEPIECE DATE INDICATOR

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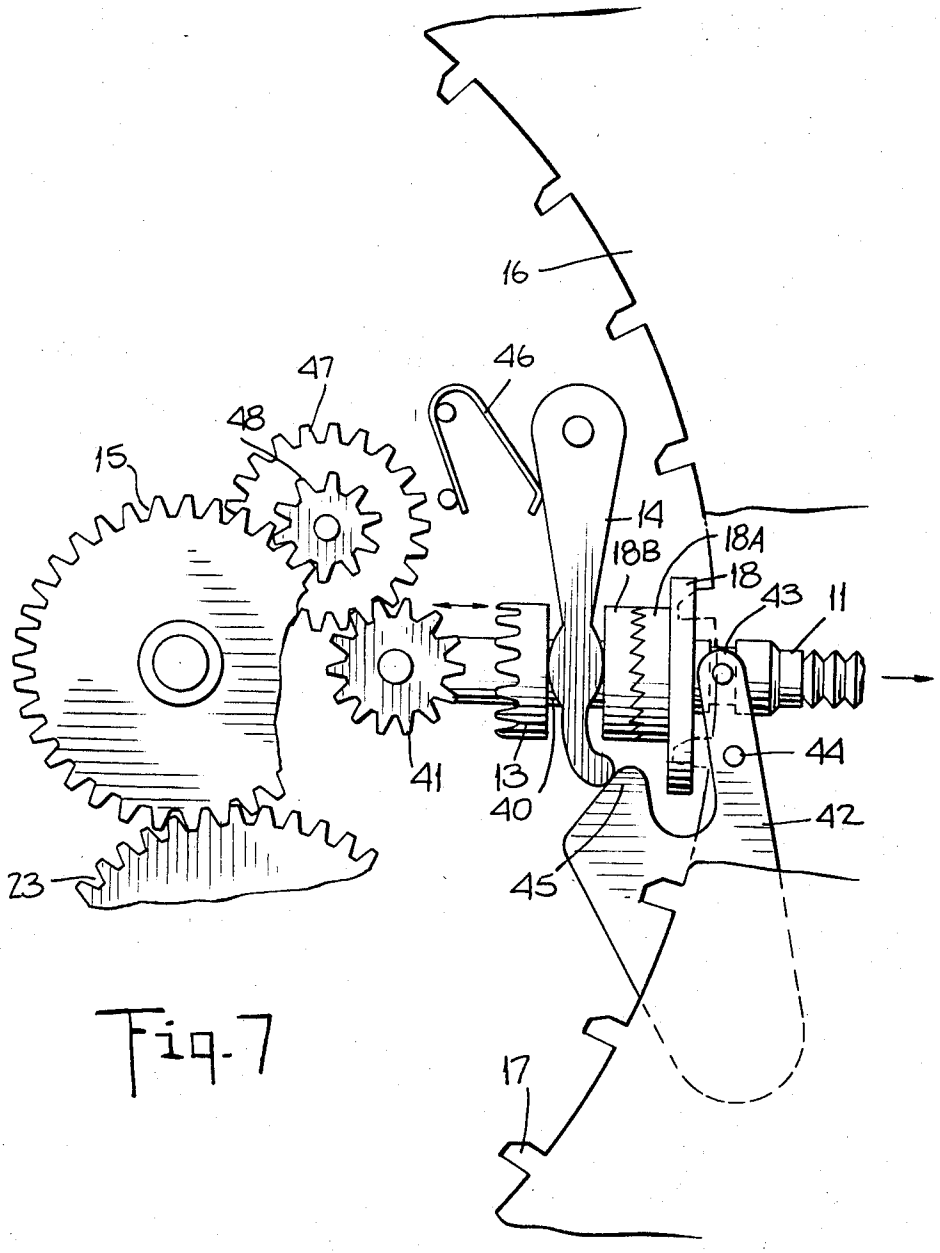

Fig. 7

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3,421,311

ACTUATING MECHANISM FOR TIMEPIECE DATE INDICATOR

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Int. Cl. G04b 27/00

ABSTRACT OF THE DISCLOSURE

A timepiece is provided with a date-indicating ring having an inner toothing which is engaged by a corrector finger projecting from a collar mounted on the crown tem, such that when the crown is at its 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. An automatic trigger mechanism is also provided to move the date-indicating ring one day per twenty-four hour period.

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.

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 effetced 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., and

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

FIG. 7 is a plan view, in enlarged form, illustrating the time setting 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 therefore 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.

As best seen in FIG. 7, mounted on a square section of stem **11** is a clutch wheel **13** which is free to slide but not

to rotate thereon. Clutch wheel **13** is shifted inwardly by clutch lever **14**, which extends across an annular groove **40** in the clutch wheel, and engages a setting wheel **41** when the stem is fully retracted by its crown to the first or pull-out position. This pull-out position is the position for time-setting.

This action is accomplished by means of a setting lever **42** having an extension arm **43**. Setting lever **42** is pivotally connected to stem **11**, such that when the stem is pulled out, lever **42** swings about its pivot point **44**, whereby the nose **45** of the setting lever pushes against the end of clutch lever **14**, which in turn forces clutch wheel **13** inwardly into engagement with setting wheel **41**. A spring **46** acts to normally urge clutch lever **14** in a direction effecting disengagement of the clutch wheel and setting wheel, in which "in" position of stem **11**, ratchet teeth **18***a* engages mating teeth **18***b*, such that when the crown is rotated, collar **18** also rotates to effect adjustment of date ring **16**.

Setting wheel **41** intermeshes with minute wheel **47** on whose axle is mounted a pinion **48**, which in turn intermeshes with hour wheel **15**, such that with the stem pulled out to the time-setting position and the crown is rotated, minute wheel **47** is caused to turn, thereby setting the minute and hour hands in the usual manner. The hour wheel **15** make 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 plae 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 patch 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" or second 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 cutch elements **18***a* and **18***b* are disengaged, since clutch wheel **13** 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 hearing 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 relating 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 and the lower edge **33** thereof is 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. 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 **17A** and **17B**, the nose being close to tooth **17A**.

When trip finger **24** rotates further in the counterclockwise 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 **17B** 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 that 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.

What we claim is:

1. In a calendar timepiece having hour and minute hands and a rotatable stem assembly adapted in a first position to engage a setting mechanism so that said hands may be set manually, said stem having a second position in which said hands are disengaged from said setting mechanism, said timepiece including a wheel making a single revolution each twenty-four hour period and a dual actuating mechanism for advancing a rotatable calendar ring having a series of teeth thereon, one tooth for each of the thirty-one numbers appearing on the face of the ring, said mechanism comprising:

(A) a mechanical setting device for said ring manually to correct the setting thereof at the end of those months having less than thirty-one days, said device including:

(a) a collar freely mounted on said step and having projecting therefrom a finger adapted to engage the teeth of said ring, and

(b) means intercoupling said collar and stem only at the second position thereof whereby rotation of the stem causes said finger to turn said ring, and

(B) an automatic trigger mechanism to advance said ring one tooth per twenty-four hour period.

2. An actuating mechanism as set forth in claim **1**, further including a detent spring engaging said finger to impart resistance to the rotation thereof.

3. An actuating mechanism as set forth in claim **1**, wherein said means intercoupling said finger and said stem is constituted by a two-part clutch, one element of which is integral with said finger and the other is arranged for rotation with said stem, said elements being disengaged in the out position of said stem.

4. An actuating mechanism as set forth in claim **1**, wherein said trigger mechanism includes a trip arm having a nose thereon adapted to engage the teeth on said ring, and a trip finger operatively coupled to said wheel for moving said arm from a triggered position to a spring-biased cocked position.

5. An actuating mechanism as set forth in claim **4**, wherein said arm has a projection thereon which when engaged by said trip finger cocks said arm and when removed therefrom releases said arm to cause said nose to advance said ring instantaneously.

6. An actuating mechanism as set forth in claim **5**, further including a bumper disposed in the path of said arm to limit the displacement thereof upon release and to prevent rotation thereof whereby said nose remains in the path of said teeth to prevent an advance of said ring in excess of one tooth.

7. In a calendar timepiece provided with an hour wheel and a rotatable stem assembly adapted in a first position to engage a setting mechanism so that said hour wheel and an hour hand thereon may be set manually, said stem having a second position wherein said hour wheel makes a single revolution each twelve-hour period, a dual actuating mechanism for advancing a rotatable calendar ring having a series of teeth on the inner periphery thereof, one tooth for each of the thirty-one numbers appearing on the face of the ring, said mechanism comprising:

(A) a mechanical setting device for said ring to manually correct the setting thereof at the end of those months having less than thirty-one days, said device including,

(a) a collar freely mounted on the stem of said assembly and having a finger projecting therefrom to engage the teeth of said ring, and

(b) means intercoupling said collar and said stem only at the second position thereof whereby rotation of the stem causes said finger to advance said ring, and

(B) an automatic advance arrangement to move said ring one day per twenty-four hour period, said arrangement including,

(a) a trip wheel operatively coupled to said hour wheel to make one full rotation per twenty-four hour period, and

(b) a trigger mechanism actuated by said trip wheel and adapted once a day to engage a tooth on said ring to advance same.

8. In a timepiece as set forth in claim **7**, wherein said trigger mechanism includes a trip arm having an opening therein within which is disposed a trip finger mounted on said trip wheel and rotating therewith, said opening being contoured and including a projection which is engaged by said finger in the course of rotation to slide said arm against the action of a spring, said arm at one end having a slot therein within which is received a guide pin secured to said base, the movement of said arm being limited by a bumper which engages the other end of said arm.

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