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Kato

[11] **3,842,590**

[45] **Oct. 22, 1974**

[54] **CALENDAR TIMEPIECE**

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[73] Assignee: **Citizen Watch Company Limited,** Tokyo, Japan

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[52] **U.S. Cl.** **58/58,** 58/4

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

[58] **Field of Search** 58/4–6, 58

[56] **References Cited**

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2,741,082	4/1956	Elberg	58/5
3,621,648	11/1971	Takagi	58/58
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Primary Examiner—Lawrence R. Franklin

Attorney, Agent, or Firm—Robert T. Tobin

[57] **ABSTRACT**

An improved calendar timepiece in which the correspondence between the month and date can be easily adjusted to obtain any desired date and month relationship.

3 Claims, 9 Drawing Figures

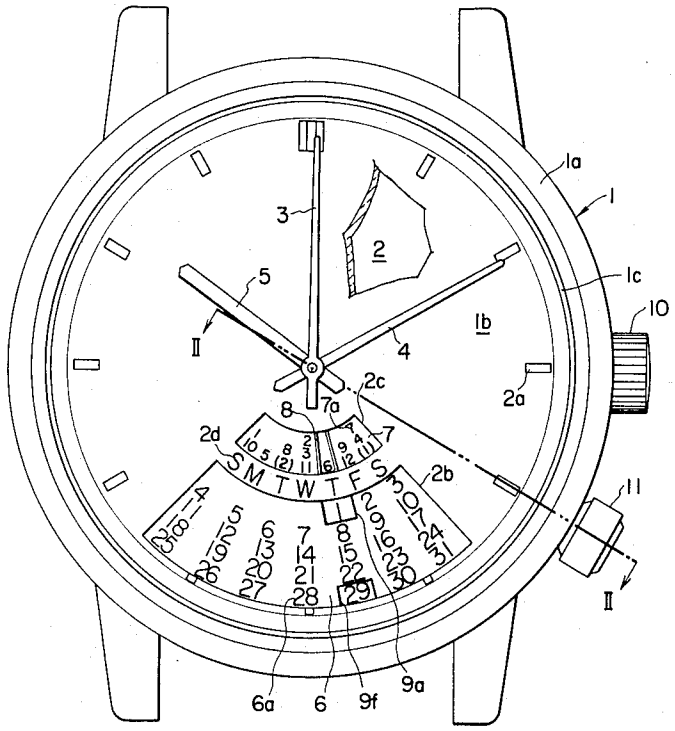


FIG. 1

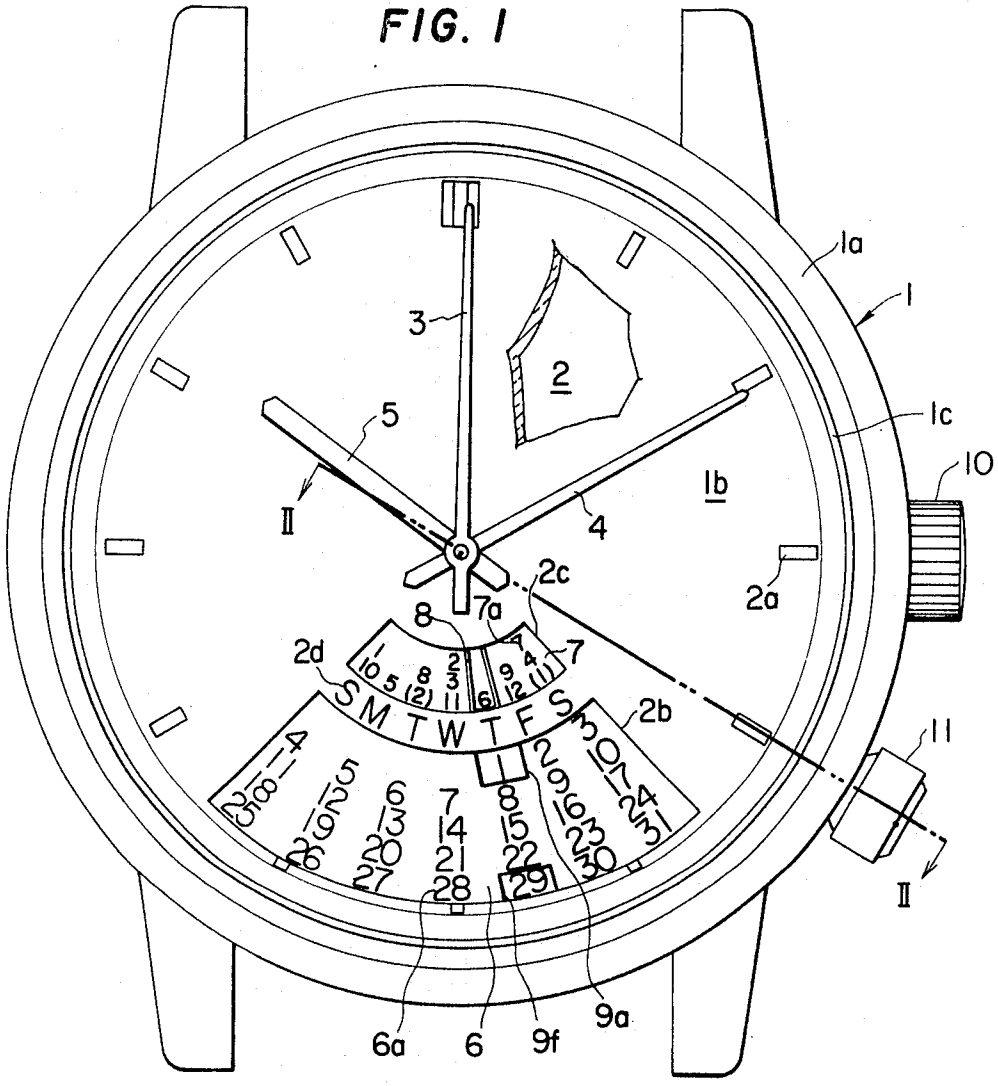

1a
1
3
2
5
1c
10
II
4
1b
2c
2a
8
7a
7
2d
S M T W T F S
2b
11
II
6a
6
9f
9a

FIG. 2

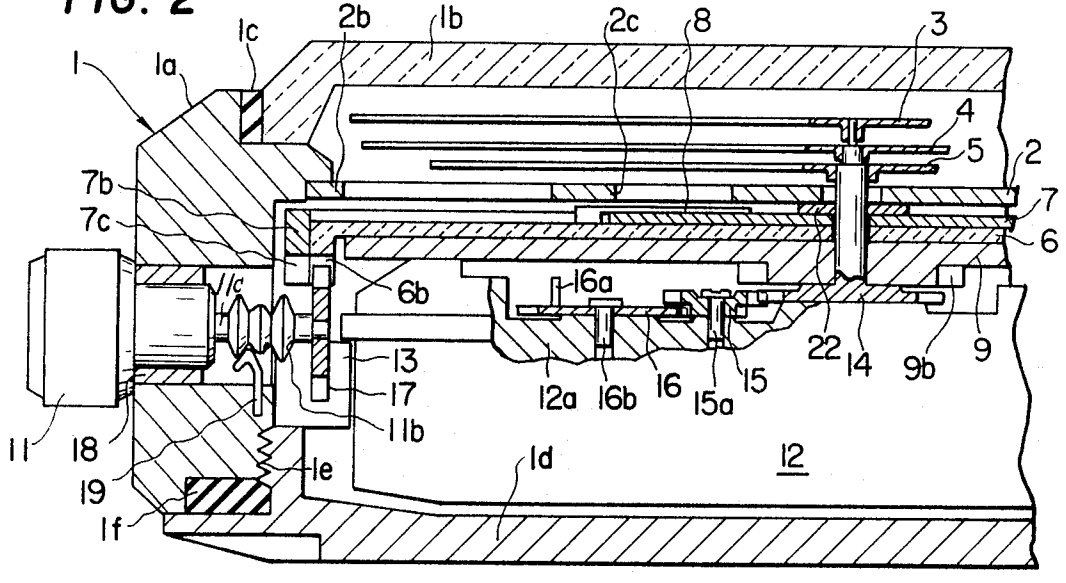

1
1a
1c
2b
1b
2c
8
3
4
5
2
7b
7c
7
6
6b
16a
1c
13
17
11b
12a
16b
16
15a
15
22
14
9b
9
11
18
19
1e
1d
12
1f

FIG. 3

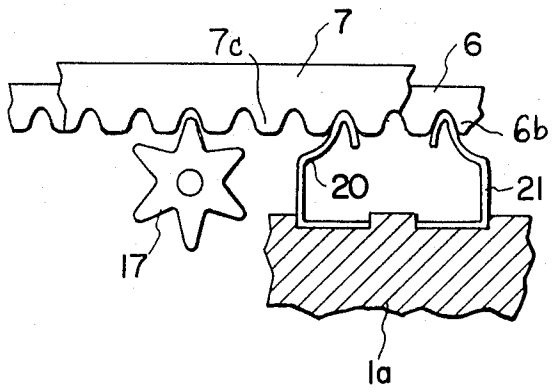


FIG. 5

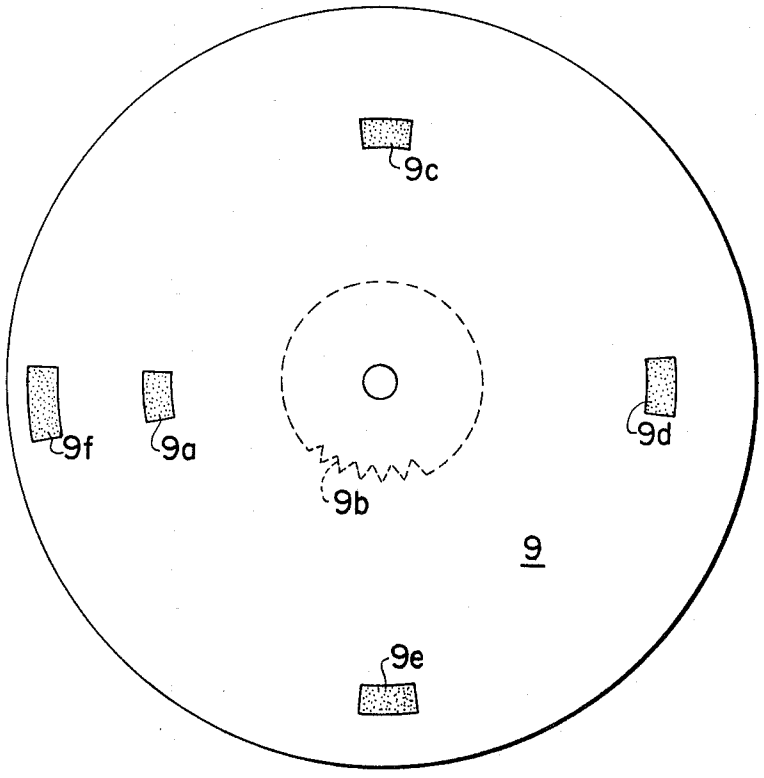


FIG. 4

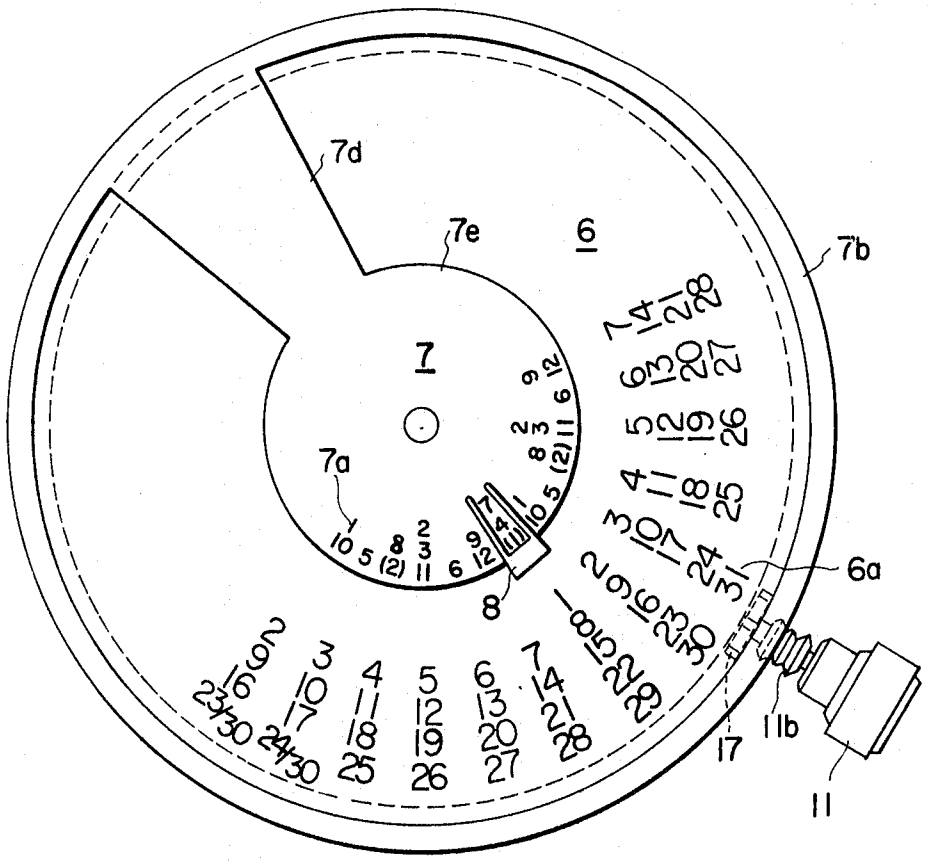


FIG. 6

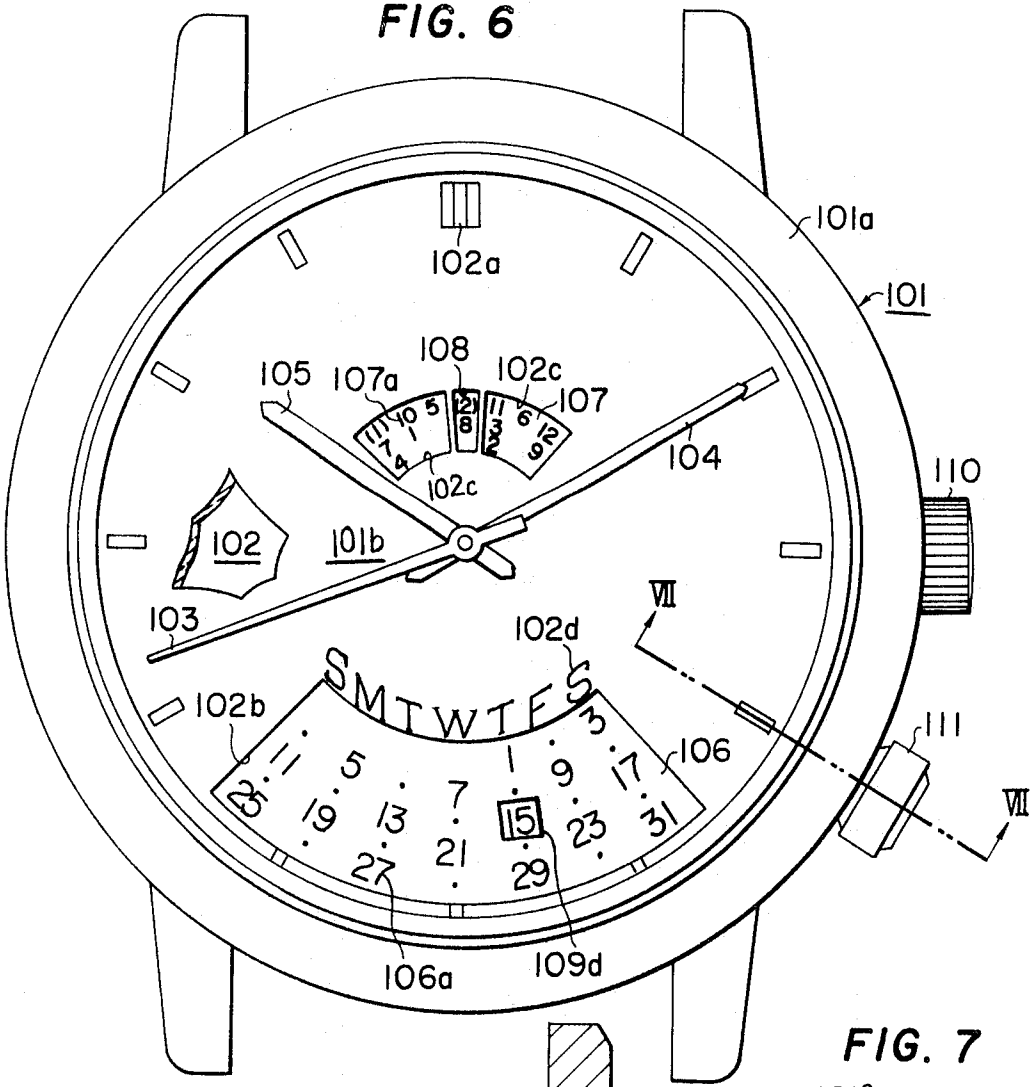

101a
101
102a
108
105
107a
102c
107
104
110
102
101b
103
VII
102d
SMTWTFS
102b
106
111
VII
106a
109d

FIG. 7

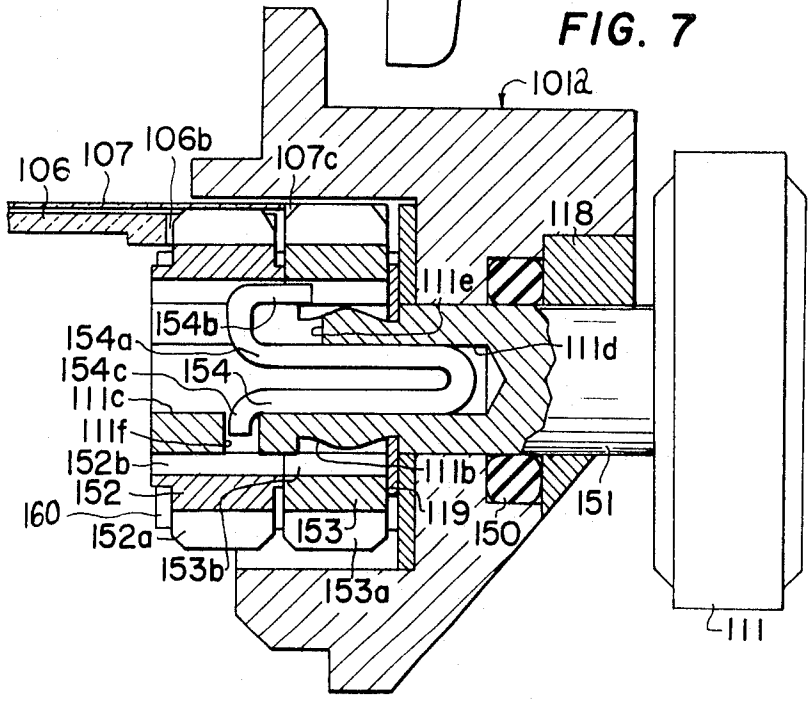
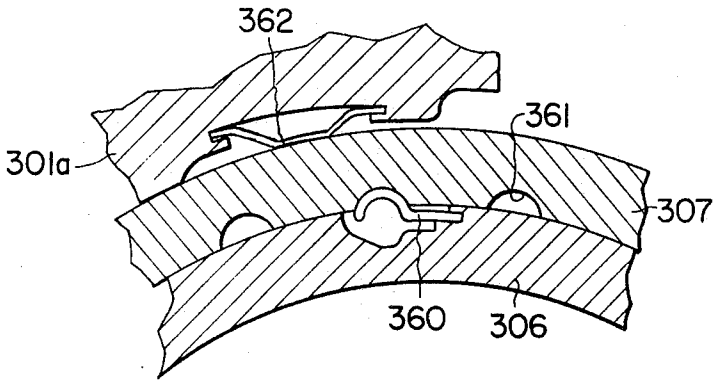

101d
106
107
106b
107c
118
111e
154a
154b
111d
154c
154
111c
111f
152b
111b
152
160
152a
153
119
150
151
153b
153a
111

FIG. 8


204
201a
201
203
209c
209g
208
(2) 8
207
205
S M T W T M S
7 · 21
1 · 15 · 29
9 · 23
3 · 17 · 31
5 · 19
11 · 25
13 · 27
202d
206
202b
210
202a
211

FIG. 9


362
361
301a
307
360
306

CALENDAR TIMEPIECE

This invention relates to improvements in and relating to a calendar timepiece.

There are several types of conventional calendar timepieces.

The most typical type of conventional calendar timepiece is one in which the date or date and day of the week are represented on the timepiece.

In the second and less popular type of timepiece, a series of dates covering a complete month are arranged along the periphery of the dial and a separate ring carrying week day representations is rotatably mounted relative to the dial. Any desired week day-date correlation for a month can be obtained by turning the desired amount the date ring relative to the dial.

In the third and less popular type timepiece, the complete monthly dates are represented on the dial in stepped week groups, the months of a year also being represented on the same dial. A rotatable ring carrying the indicia for the day and year in two concentric circles is mounted below the dial (refer to U.S. Pat. No. 3,621,648 patented Nov. 23rd, 1971 to Tooru Takagi). Any desired day-date correspondence for a specifically selected month can be established by turning the said ring, so as to bring the corresponding year representation thereon into registration with the selected month representation on the dial.

The aforementioned conventional calendar timepieces represent, however, various drawbacks.

In the case of the first type of calendar timepiece, day-date representation of only the instant day is shown.

In the case of the second type of timepiece, the day representation is arranged repeatedly on a circle, thus confusion may be frequently encountered.

In the case of the third type of timepiece, the first day of a week, or Sunday, may not always be positioned at the left-hand extremity of the calendar.

The main object is to provide an improved calendar timepiece in which the varying correlations for week and monthly day dates can be easily established.

It is another object of this invention to permit positioning the first calendar day of the month in spite of any necessary calendar adjustment in order to obtain any correct day-date correspondence, at the beginning or left hand end of the calendar representation when seen from the side of a viewer.

A subsidiary and optional object of the present invention is to provide an improved calendar timepiece wherein the calendar representation is grouped substantially similar to a wall calendar.

In order to achieve the objects of the invention, several main features are used as set forth in the present specification.

These and further objects, features and advantages of the invention will appear more apparent when the following detailed description of the invention is read with reference to the accompanying drawings illustrative of several preferred embodiments of the invention.

In the drawings:

FIG. **1** is a plan view of the outline configuration of a first preferred embodiment of the invention.

FIG. **2** is an enlarged section of the first embodiment of FIG. **1** taken substantially along a section line II—II shown therein.

FIG. **3** is a schematic view, illustrating the cooperation between several parts employed in the first embodiment.

FIG. **4** is a plan view of the calendar display mechanism employed in the foregoing embodiment, in an enlarged scale relative to FIG. **1.**

FIG. **5** is a plan view of a date indicator employed in the calendar display mechanism shown in FIG. **4,** in an enlarged scale relative to FIG. **1.**

FIG. **6** is a view similar to FIG. **1,** showing a second embodiment of the invention.

FIG. **7** is a partial and enlarged cross sectional view of several inner parts of the second embodiment, taken substantially along a section line VII—VII shown in FIG. **6.** In FIG. **7** several unimportant elements thereof, such as the crystal and the back cover of the timepiece have been omitted from the drawing for simplicity.

FIG. **8** is a similar view to FIG. **1,** showing a third embodiment of the invention.

FIG. **9** is an enlarged section, showing several modified parts of the calendar display mechanism.

Now referring to FIGS. **1 – 5,** the first embodiment will be described in detail.

Numeral **1** represents a watch casing which comprises mainly a case band **1***a;* a crystal **1***b* fixedly, but detachably, press fit to the case band through the intermediary of a first resilient sealing ring **1***c;* and a back cover **1***d* fixedly, but detachably mounted onto said case band through mating screw threads **1***e* and a second resilient sealing ring **1***f.*

A conventional dial **2** is provided with **12** hour symbols **2***a* arranged concentrically thereon and further with sector-shaped windows **2***b* and **2***c* in radial registration to each other for showing dates and months in digital form. In the present embodiment, the dial **2** is fixedly attached to the case band **1***a* by glueing. Numerals **3, 4** and **5** represent seconds-, minute- and hour hands, respectively.

The viewer may observe through first window **2***b* a correspondingly limited part of the surface area of a rotatable date display dial **6,** covering a month of a first composite calendar **6***a* printed thereon. He may observe, at the same, time, through second window **2***c* a limited part of a rotatable month display dial **7,** covering a year of a second composite calendar **7**a printed thereon.

A series of characters, S, M, T, W, T, F and S, are printed on a narrow strip-like area defined by and between the windows **2***b;* **2***c* for representing seven successive days of a week from Sunday to Saturday. Numeral **8** represents a U-shaped, month indicator attached fixedly at its root end to the dial **6** by glueing, welding or similar conventional technique. In the present embodiment, the dial **6** has been made of a transparent plastic material, to permit observation of one or two of indicator marks **9***a*, **9***c* . . . . . **9***f* printed on the upper surface of a rotatable indicator dial **9** which is arranged underneath the dial **6** concentrically therewith, as clearly seen from FIG. **2.**

Numeral **10** represents a conventional winding crown which serves time-setting and barrel-winding functions. Circumferentially displaced a predetermined small distance from the winding crown **10,** there is a manually operable knob **11** adapted for selective adjustment of the rotational position of either dial **6** or **7,** as will be more fully described hereinafter.

Numeral **12** represents a conventional watch movement, only partially shown, which is held in position by a holder ring **13**, the latter being kept in position by case band **1**a and back cover **1***c*, although the specific positioning means has been omitted because it is well known in the art.

As a part of the watch movement **12**, there is provided a cannon wheel **14** which performs a complete revolution every 12 hours and an hour hand **5** conventionally attached thereto. A date wheel **16** performs a complete revolution every **24** hours by being driven through a duplicate gear type intermediate wheel **15** from the cannon wheel. A gear **9***b* having 28 teeth is made integral and concentric with the date indicator dial **9**, as clearly seen from FIGS. **2** and **5**. Said date wheel **16** is fed one tooth pitch every twenty four hours by contact with a drive pin **16***a* which is studded on date wheel **16**.

The dial **9** is loosely mounted on the cannon wheel **14** and normally held in position by contact with a conventional jumper, not shown. The intermediate wheel **15** and date wheel **16** are rotatably mounted on respective studs **15***a* and **16***b* which are studded on a conventional pillar plate **12***a* belonging to the watch movement **12** and only partially shown.

The dial **6** has been made from a transparent plastic material and provided at the peripheral rim on the lower surface with a crown gear part **6***b* having twenty eight teeth, said dial **6** being rotatably mounted at its perforated center by the cannon wheel **14.**

The first composite calendar **6***a* represents generally a sector-like shape and comprises a group of dates covering two-odd months partially overlapped and arranged in five parallel circumferential rows and along 13 radial lines corresponding to 13 of 28 tooth pitches of the crown gear **6***b* (see, FIG. **4**).

Month display dial **7** is made of a plastic material, having an outer rim **7***b* provided at its lower surface with a crown gear portion **7***c* which has 28 teeth arranged in radial registration with similar teeth at **6***b*. The rim **7***b* has a radially inwardly extending arm **7***d* made integral therewith, said arm being made integral with a concentric dial proper **7***e*. The thus formed dial **7** is rotatably mounted at the correspondingly perforated center of the dial proper on the cannon wheel **14.** The second composite calendar **7***a* has generally a sector-like outline and arranged along and inside of the outer periphery of the dial proper **7***e*, as specifically seen in FIG. **4.** This calendar **7***a* comprises a group of digits representing two 12 months year partially overlapped at "7" (July) and "4" (April) and in three circumferential rows along 13 radial lines corresponding to 13 of the 28 teeth pitches of the crown gear **7***c*. Since the crown gears **6***b* and **7***c* have the same number of teeth arranged in mutual radial registration and the same tooth pitches, the second composite calendar **7***a* has the same sector angle with that of the first composite calendar **6***a*.

Knob **11** is rotatably mounted in a bearing sleeve **18** which is press-fit into the case band **1***a* and has its reduced diameter stem **11***c* freely and inwardly projecting from said bearing sleeve and rigidly carrying a stepped positioner **11***b* and a clutch pinion **17** one after another. Said pinion is adapted for selective engagement with either crown wheel **6***b* or **7***c* depending upon the axial position of the knob **11**, as will be more fully described. For assuring the axially selected position of the knob **11**, a click spring **19** is fixedly mounted on the case band **1***a*, so as to cooperate with said positioner **11***b*.

With the knob **11** and its stem **11***c* positioned as shown in FIG. **2**, pinion **17** is kept in engagement with the crown gear part **6***b* of date display dial **6.** When the knob and its stem are pulled out one step from the position shown, the pinion **17** is brought into engagement with the neighboring crown gear part **7***c* of month display dial **7.** Jumper springs **20** and **21** are fixedly mounted on the case band **1***a* and kept in meshing engagement with the teeth **7***c* and **6***b* of these dials **7** and **6**, respectively, as specifically shown in FIG. **3**, for resiliently positioning the latter.

Numeral **22** represents a separator disc which is rotatably mounted on the cannon wheel **14** for avoiding mechanical interference between the dials **2** and **7** (FIG. **2**).

As may be well seen from FIG. **1**, a viewer can observe the first composite calendar **6**a through the related viewing window **2***b*. This calendar is composed of a series of date digits covering a complete odd month, said calendar having an arrangement of dates in resemblance with a regular wall calendar.

The number of days depends upon the kinds of months or whether the month is odd or even, and whether it is a regular or leap year. The series arrangement of odd and even months is definite for each regular or leap year. When the week day for January **1**st, for instance, of a regular or leap year is determined, all the week day-date relationship for the remainder of the year is determined.

When the months of a complete year are grouped according to the week day begining the first day of each month, the following table is obtained: January and October; May; August and leap year February; non-leap year February, March and November; June; September and December; and July, April and leap year January. The second composite calendar **7***a* resides in two such month groups, omitting, however, a common group of July, April and leap year November, as example.

The operation of the first embodiment so far shown and described is as follows:

As described hereinbefore, date indicator dial **9** is advanced counter clockwise in FIG. **1** a tooth pitch **9***b* every **24** hours by the driving action of pin **16***a* of date wheel **16.** Date indicator mark **9***a* is positioned on the dial **9**, so as to have a radial distance corresponding to that of the innermost row of the composite calendar **6***a*, including date digits **1, 2 . . . . . 7.** Mark **9***c* has a one step longer radial distance corresponding to the second row including the date digits **2 – 14** and it is positioned at a 90° apart central angle, as measured clockwise in FIG. **5** from the first mark **9***a*. **9***d*, **9***e* and **9***f* are positioned successively in the similar manner. Marks **9***a*, **9***d* and **9***f* are positioned on the same radial line.

Rotation of the dial **9** is stopped by the action of a jumper, not shown, when the marks **9***a*, **9***c* and **9***f* are brought into radial registration with the date digits of the date calendar **6***a*. When it is assumed that the position of the dial **9** is such that with rotational movement thereof, the first mark **9***a* moves counter clockwise from the date digit "**1**", then, the mark **9**a will be successively brought into registration with the digits "**2**" and "**3**" for display thereof, upon the lapse of each 24 hours. When the first mark **9***a* disappears from the display area of the window **2***b*, the next succeeding indica-

tor mark 9*c* will appear in the window 2*b* from the left. Similar operational principles apply to further indicator marks 9*d*, 9*e* and 9*f* in succession, and so on.

For convenience of the description, it is assumed that the instant day is January 1st of a year. The watch wearer manipulates knob **11** shown in FIG. **2** so as to rotate the dial **6** through pinion **17** and crown gear part 6*b* until the first date digit "1" is brought into radial registration with a predetermined day symbol "T" (second occurence) which means Thursday if the first day of the year corresponds thereto, as shown in FIG. **1.**

Next, the watch wearer must being the month digit "1" or "(1)" corresponding naturally to January as mentioned hereinbefore, into the next indicating space of a "U" of the member **8.** For this purpose, he can pull out knob **11** together with its stem **11***c* one stop and turn it properly, so as to rotate the second dial **7** through gear meshing at **17**; 7*c*.

Further, the wearer manipulates the time-setting crown or knob **10** through **14, 15** and **16** to the dial **9.** Then, with the regular time-keeping operation of the watch movement **12,** successive indicator marks 9*c* - 9*f* will scan the respective second, third, fourth and fifth date digit rows, as was referred to hereinbefore, as the month of January elapses. During this period, all the successive date digits **2 – 31** are displayed one after another after every 24 hours.

On the first day, Sunday, of February, the wearer manipulates the knob **11** so as to rotate the dial **6** together with its month indicator **8,** to catch the second month digit "2" for regular year or "(2)" for leap year by the indicator, whereupon the day-date correspondence will become proper for February. When the last day of the foregoing month (January in this case) corresponds to Saturday, the dial **9** must be rotated 90° in the reverse direction. However, if the last day of the foregoing month corresponds to any other day, such reverse rotation of the dial **9** is unnecessary. This is becuase the indicator marks 9*a;* 9*c* . . . . . 9*f* are positioned on four quardrant lines and the first and fifth indicator marks 9*a* and 9*f* are positioned on one and the same radial line of dial **9,** said four quadrants being allocated to 4 weeks of the calendar.

With the regular time-keeping operation of the movement **12,** the marks 9*a*, 9*c* . . . . . 9*f* will scan all the date digits successively for the indication of all the February dates, and so on.

When the 31st day, Thursday, of December of the same year comes, the wearer knows the type of day, Friday, of the first day of January of the year. Then, he operates knob **11** positioned as shown in FIG. **2,** so as to bring the first date digit "1" of the first calendar 6*a* into coincidence with the day mark, to bring the first month digit "1" of the second calendar 7*a* into coincidence with the month indicator **8,** and so on.

Even before arrival of the first day of a month or a new year, a calendar may be conveniently reproduced to permit advance consulation of the calendar for optimum future planning or the like by a corresponding advance manipulation of knob **11** in two different ways.

Next, referring to FIGS. **6** and **7,** the second preferred embodiment will be described in detail hereinbelow.

In the present embodiment, the month indicator **108** represents a small window formed through regular dial **102** in place of the movable arrangement employed in the foregoing embodiment. Further, month display window 102*c* is arranged on the dial **102,** indeed, substantially in opposition to date display window 102*b* relative to the center of the dial. It is, therefore, necessary to provide date display dial **106** and month display dial **107** with a possibility of synchronous rotation in the same direction. Thus, the manual operating mechanism for these dials is different in its structure and function from that employed in the foregoing first embodiment, while other operational means may be designed similar to those corresponding parts of the first embodiment. For better understanding and easy comparison of the present embodiment with the first one, same or similar parts of the apparatus are denoted with respective same reference numerals, each being added, however, with **100.**

Date display dial **106** is provided at its outer periphery with twenty eight teeth 106*b*, a first or date composite calendar 106*a* being formed on the upper surface of the dial **106.** As seen, odd date digits are only completely shown, while even date digits have been replaced by respective dots for simplicity. The date of the instant day can be demonstrated by one of the indicator marks 109*a;* 109*c* - 109*f* on date indicator dial **109.**

Dial **102** is formed with date display window 102*b* and day marks 102*d* "S, M, T, W, T, F and S" corresponding to a complete week and shown in a slightly decorative mode.

Knob **111** having a stem **151** rigid therewith is axially slidably and rotatably mounted in case band 101*a* in a water tight way by the provision of a resilient sealing ring **150** and a bearing sleeve **118** which is fixedly mounted in the case band by means of fixing means such as screws, or press fit, both of which are not shown. On the inner end of the stem **151,** a pair of pinions **152**; **153** having pinion teeth 152*a;* 153*a*, respectively, are rotatably mounted and kept meshed with gear teeth 106*b;* 107*c* of date display dial **106** and month display dial **107,** respectively. These pinions **152**; **153** are made hollow and formed at their respective inner wall surfaces with spline-teeth 152*b;* 153*b*, respectively, yet in phase with each other. Axial shift of these pinions is prevented by a part of a conventional movement holder, only a part thereof being shown, and a positioner spring **119** which is rotatably mounted on the stem **151.**

Stem **151** is formed on its peripheral surface at an intermediate position between its end extremities with turn ring groove 111*b*, an axial blind bore 111*c* also being formed in the material of said stem. Said positioner spring **119** is mounted to be axially shiftable in said turn ring groove 111*b*. Main part 154a of a substantially S-sectioned spring key **154** is inserted under tension into said axial bore 111*c* which is closed at 111*d*. A flared and hooked end 154*b* of said spring key **154** is kept in slidable engagement with the spline grooves 152*b;* 153*b* of both pinions **152**; **153** in unison, while a smaller flared end 154*c* of the spring key is kept in engagement with a lateral bore 111*f* which communicates with the blind bore 111*c*.

Thus, when knob **111** is manually rotated in its shown position, motion will be transmitted therefrom to these pinions **152**; **153.**

With these pinions thus rotated by manipulation of the knob **111,** both dials **106**; **107** are correspondingly rotated.

However, when the knob **111** is axially drawn out and rotated, motion will be transmitted therefrom only to pinion **153,** on account of the limited engagement of the spring key with the spline groove **153***b* of same. In this case, only month display dial **107** is adjusted as desired in its angular position.

As aforesaid, the dials **106** and **107** can be rotatingly adjusted in unison or separately. By the united rotation of both dials **106**; **107** adjustment between date digits **106***a* and day marks **102***d* can be brought about. By the single rotation of the latter dial **107,** adjustment between month calendar mark **107***a* and month indicator **108** is brought about.

Once preset in the above mentioned way, each monthly manual adjustment can be made by the common rotation of both dials **106**; **107,** until the desired month display will appear at the small window **108.**

The whole manipulation procedures may easily be understood from the above brief description of the second embodiment by consultation of the foregoing detailed description of the first embodiment.

FIG. **8** illustrates a third embodiment of the invention. The difference in this embodiment from the foregoing second embodiment resides in mounting at 3 and 9 o'clock on both sides of its center the window at **202***b* for the date digit display and that denoted **208** for month mark display. The month display window consists exclusively of a small window at **208.** Month display dial **20,** although not shown in its entirety, has a large outer diameter so as to fully cover the third row of date digits (**15, 17** and **19** illustrated on the drawing), but it is provided with a sector-shaped large recess, (not shown,) for avoiding appearance of month digits (shown specifically and representatively as (**2**) and **8**) in the window **202***b*. By adopting this measure, the month display can be substantially enlarged for providing a clearer and more distinct representation of successive calendar months. Numeral **209***g* represents the dark colored part of the date indicator, while numeral **209***c* represents a clear part thereof adapted to show the specific and appropriate date digit concerned.

Other several parts which are denoted with the same reference numerals as those in the foregoing second embodiment, yet each having added the digit **100,** can be easily understood in their structure and function when consulting with the same or similar parts shown and described in the second embodiment.

When common and unitary rotation of the date display dial and month display dial is required as in the case of the second and third embodiments, various drive mechanisms serving that purpose may be adopted as occasion requires, other than that shown in the second embodiment. In FIG. **9,** a modification thereof is shown, wherein all the reference numerals adopted have the same respective numerals attached to those of the first embodiment, yet each has a "**300**" added for easy comparison and identification.

Month display dial **307** is formed with a number of grooves **361** on the inside surface thereof, the pitch of these grooves being selected to be equal to the divided sector angle defining the radial arrangement of the date digits. Date display dial **306** is attached fixedly with a spring member **360** which is adapted for successive engagement with said recesses **361.** Case band **301**a is provided with a spring member **362** which is adapted for exerting a resiliently frictional braking force upon the dial **307.** When the dial **306** is rotated forcibly, then it can not accompany the other dial **307** on account of the braking force applied by the spring **362.** On the other hand, when the month display dial **307** is forcibly rotated, it will accompany the neighboring date display dial **306.**

The embodiments of the invention in which an exclusive property or privilege is claimed are as follows:

1. A calendar timepiece comprising:
a casing having a dial thereon;
said dial having hour indicia regularly spaced about the periphery thereof, a first window, a second window, and weekday indicators fixed on said dial adjacent said second window designating in order Sunday through Saturday;
a month disc viewable through the first window having indicia thereon designating the months of the year;
a calendar disc having indicia thereon designating the dates of a month, said calendar disc indicia being located such that when the first date is positioned adjacent the corresponding weekday indicator, a complete monthly calendar is viewable through said second window with each date aligned with the proper corresponding weekday indicator;
setting means mounted on said casing for manually setting said month disc and said calendar disc;
a timepiece movement;
hour, minute, and second hands driven by said timepiece movement overlying said dial;
and a day disc driven by said timepiece movement having means coacting with said date indicia for indicating automatically the day of the month.

2. A calendar timepiece as in claim **1** further comprising means connected to said setting means for selectively changing the month disc and the calendar disc, and means connected to said setting means for changing the month disc and calendar disc in unison.

3. A calendar timepiece as in claim **2** wherein the month disc and the calendar disc are so arranged in said timepiece that when the calendar disc and month disc are adjusted to indicate the correct month and the calendar disc indicia is positioned adjacent the corresponding weekday indicator, and the means for changing the month disc and calendar disc are operated in unison to correctly position the calendar disc indicia adjacent the corresponding weekday indicator for the next month in said second window, the month disc is correspondingly adjusted to correctly indicate the next month within said first window.

* * * * *