June 7, 1955 M. T. VAN KAMPEN 2,709,885

CALENDAR MECHANISM

Filed Dec. 24, 1952 2 Sheets-Sheet 1

FIG.1

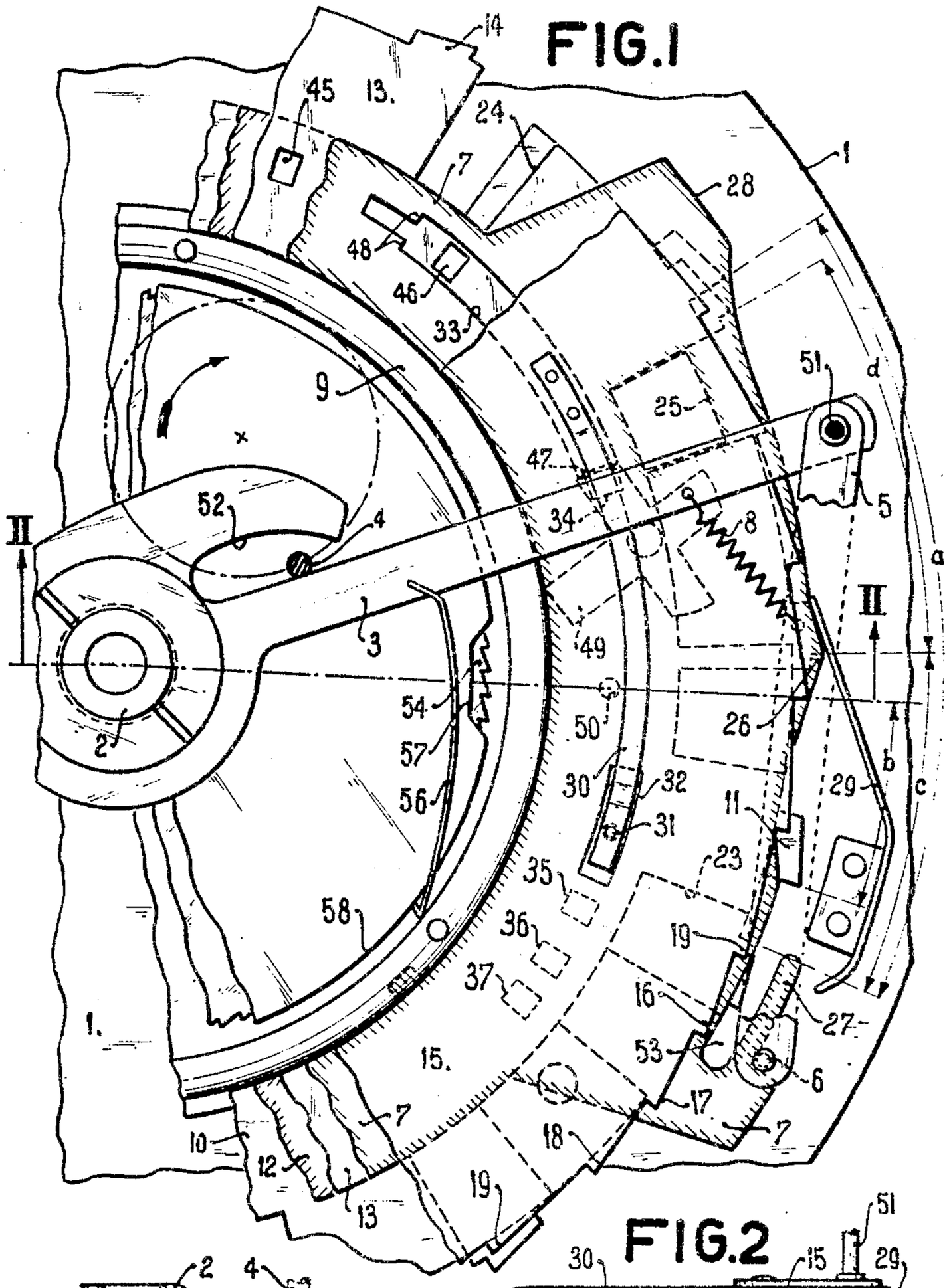
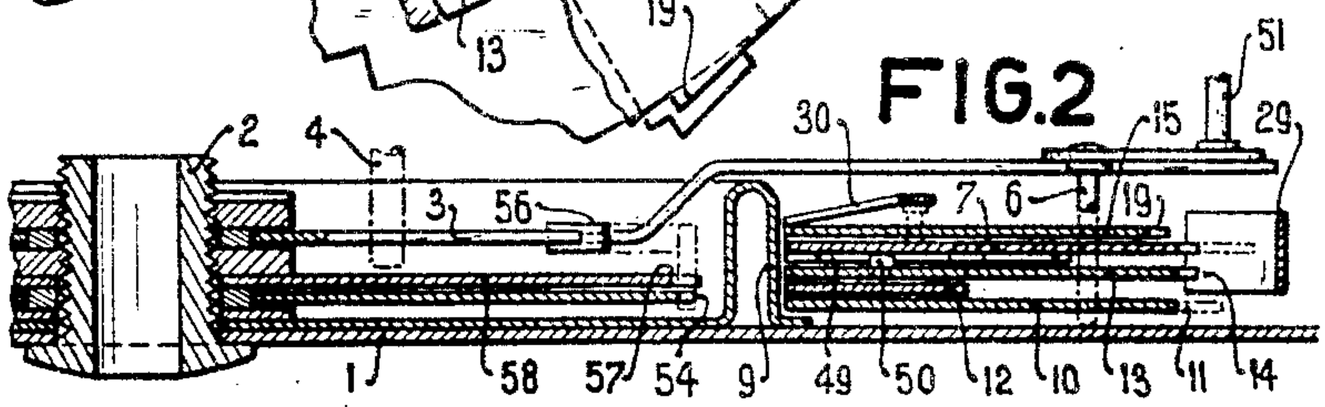


FIG.2



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CALENDAR MECHANISM

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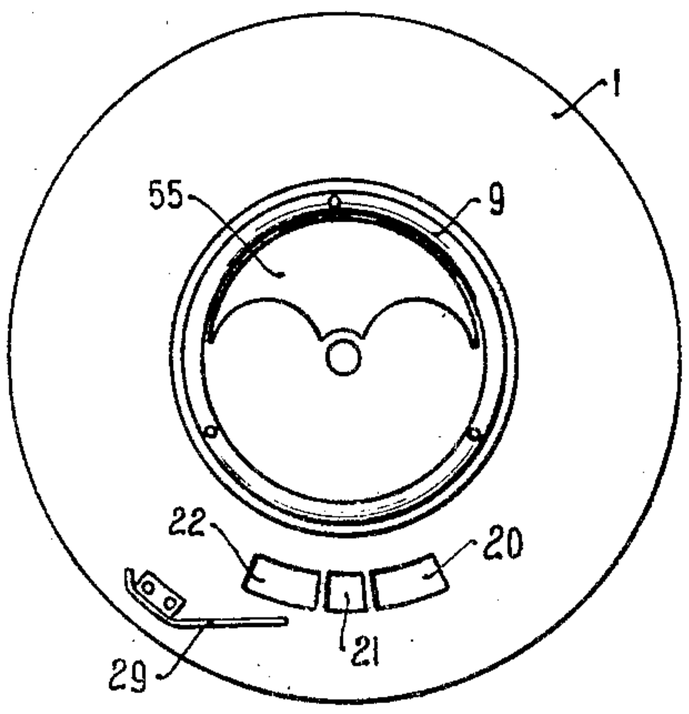

FIG.3

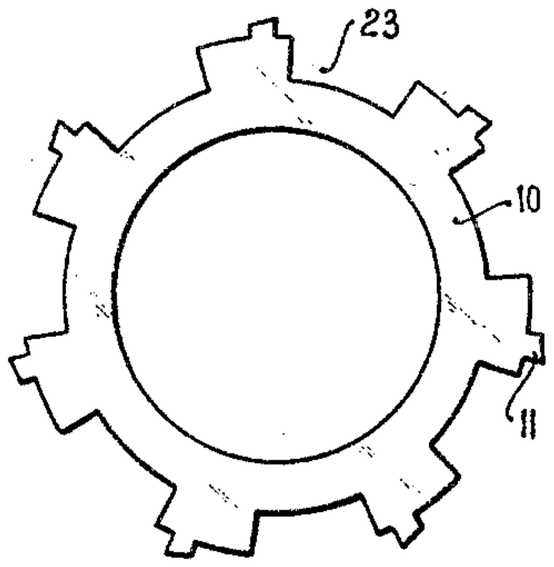

FIG.4

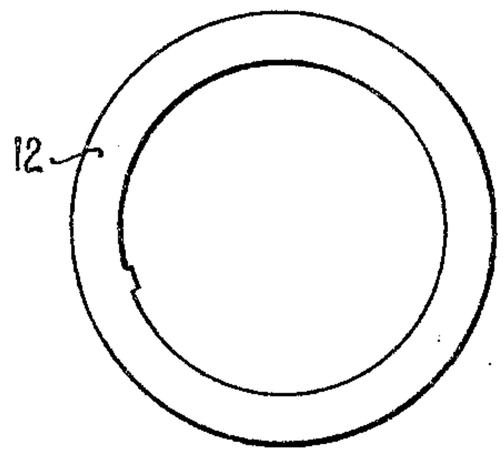

FIG.5

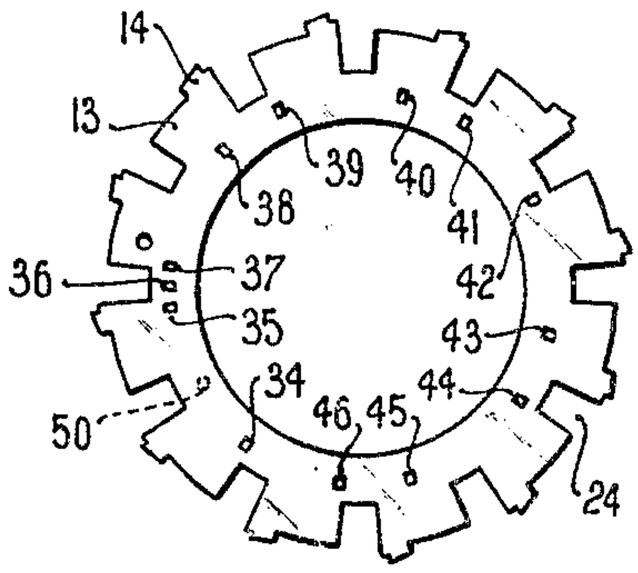

FIG.6

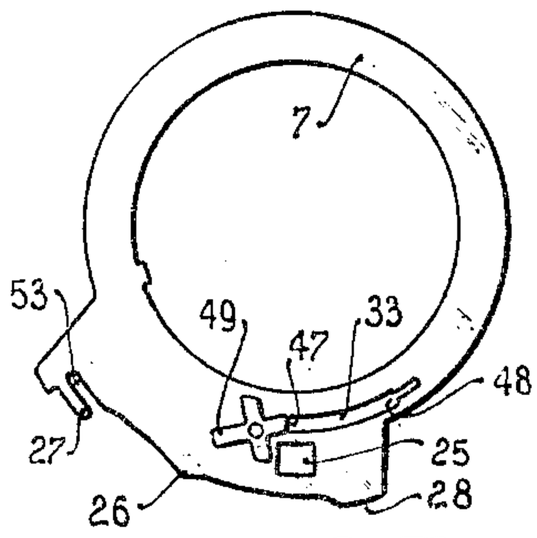

FIG.7

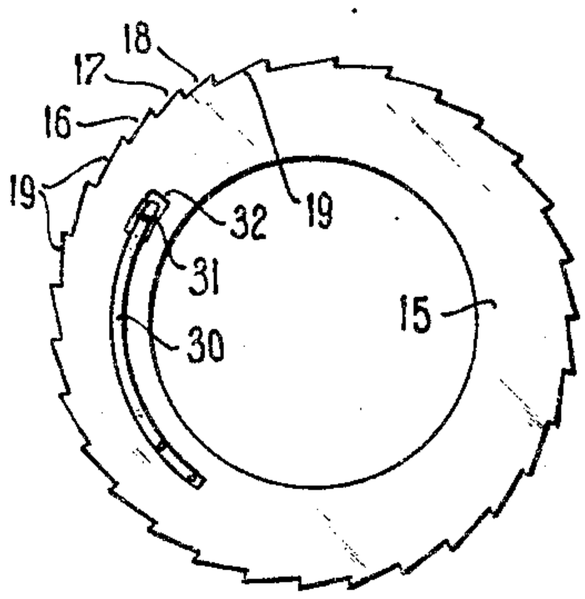

FIG.8

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2,709,885

CALENDAR MECHANISM

Marinus T. Van Kampen, Heemstede, Netherlands

Application December 24, 1952, Serial No. 327,773

Claims priority, application Netherlands December 28, 1951

3 Claims. (Cl. 58—5)

The invention relates to a calendar mechanism comprising a driving arm provided with a catch, said arm being adapted to be rotated or swung to and fro about an axis by the shaft of the hour-hand of a clockwork or by hand, and at least three discs which are rotatably mounted behind a dial-plate and are provided on their peripheries with teeth or abutting edges adapted to be brought into the path of and to be engaged by said catch, said discs carrying the names of the days of the week, the date numbers and the names of the months, respectively, and each time being rotated through certain angular distances about said axis by means of said catch after the driving arm has completed certain numbers of revolutions or oscillations in order to show one of these names or numbers in windows provided in the dial-plate.

Such a calendar mechanism is disclosed by the Dutch patent specification No. 47,559. In this known mechanism, which is driven by a clockwork, the catch of the driving arm is alternately rendered inactive during one revolution of the hour-hand shaft and, during the next revolution of said shaft, guided by a cam formed by teeth provided on the peripheries of the discs by means of a separate disc in such a manner, that said catch is coupled at least with the day disc and the number disc and advances each of said discs one step. In order that the month disc be advanced one step after thirty days, after thirty-one days or, at the end of the month of February, after twenty-eight or twenty-nine days and that the number disc be advanced to number 1 simultaneously with the advancement of the month disc, in the known mechanism at least four discs have to be used, each having teeth of very different shapes, some of these teeth having very complicated shapes. Such discs are difficult to manufacture and, therefore, expensive.

In such a mechanism the catch slides over the edges of the teeth and can easily move the freely rotatable discs prematurely by friction, should the discs not rotate about the hour-hand shaft with sufficient friction. Thus, the apparatus either moves with difficulty or is easily brought out of adjustment. Another disadvantage is, that the month disc must carry at least twice the name of each month so that there is very little space for each name. This makes the calendar data difficult to read in clocks of small dimensions.

The invention has for its object to provide a calendar clock mechanism, in which said disadvantages are avoided, only the catch is used for driving the discs, said catch is only brought into contact with the discs when the latter must be moved on and of which the construction is simple and cheap. It consists in that the day disc and the month disc are provided with seven and twelve angularly equidistanced equal teeth, respectively, the number disc is provided with thirty-one teeth, of which the three successive teeth provided for the advance of said disc from the numbers 29, 30 and 31 to the numbers 30, 31 and 1 are angularly spaced apart by equal angles of less than 10°, say 9°, and the remaining teeth are

angularly distanced by greater equal angles, the diameter of the day disc being greater than that of the month disc and the diameter of the latter being greater than that of the number disc, the catch being guided during the active revolution or reciprocation of the driving arm by a track provided on the periphery of a fixed disc having one or more parts, of which the radius is greater than that of the day disc, and being provided with a recess, of which the edge or wall constitutes said track and the shape is such, that the teeth of the day disc are left uncovered by the fixed disc through an arc *a* extending through an angle of $\frac{2}{7}\times 360°$ at the most and that within said arc the teeth of the number disc are left uncovered through an arc *b* extending through twice the angle between the teeth, which are angularly spaced apart less than 10°, at the most and the teeth of the month disc are left uncovered through two arcs *c*, *d* of 30° at the most, which join each other or are spaced apart by an arc of 30°, the arrangement being such, that the catch, when moving along the edge of the recess of the fixed disc, engages at least a tooth of the day disc and a tooth of the number disc in order to advance these discs one step, the month disc being provided with holes, viz. two holes for the month of February and one for each of the other months, said holes being distributed on a circle round the axis of the discs and angularly spaced apart in accordance with the number of days of the month, and that the number disc is provided with a spring loaded pin, which for coupling the month disc to the number disc is adapted to be passed through a slot in the fixed disc and introduced in one of said holes of the month disc, said coupling being realized, when the number disc is advanced after the latter has shown the number of the last day of the month in question in the window of the dial-plate, but being broken again, while the number 1 of the number disc is brought into the window, in such manner that after the establishment of said coupling first the month disc is provisionally moved by the number disc, when the latter is advanced one step by the catch, so that one of the teeth of the month disc comes to project into the path of the catch within the arc *d* of the track provided on the periphery of the fixed discs, and thereupon the step of the month is completed by the catch engaging said protruding tooth on its further travel along said track, during which completion of the step of the month disc, after a month having less than thirty-one days has been finished, the number disc is moved in its turn by the month disc until the number 1 is brought into the window, whereby the coupling between the said discs is broken again.

In this mechanism discs can be used of which the day disc is provided with seven and the month disc is provided with twelve angularly equidistanced equal teeth, whereas the number disc has thirty-one substantially equal teeth, of which three are angularly spaced by a slightly smaller angle than the remaining teeth. The construction of such discs is easy and cheap. The advantage of the teeth of the number disc having smaller angular distances is that, since there are twelve months, so that the month disc will have to be rotated through an angle of 30° per month, the advance of the number disc from the number 28 to the number 1 in the month of February can be performed within said angle of 30°. This has the effect that there is required only one single coupling member between the number disc and the month disc for rotating the number disc to number 1, when the month disc is moved from February to March. This means a considerable simplification and a guarantee for a reliable and exact operation. Moreover the adjustment of the mechanism, which requires the possibility of individual rotation of the discs, is thereby facilitated. Still another advantage is, that the fixed disc has a recess of

such shape, that the catch of the driving arm engages a tooth of a disc only as long as is necessary for advancing said disc one step and that the other teeth of the rotatable discs are covered by said fixed disc, so that said catch is prevented from sliding on and engaging said other teeth. The month disc carries the names of the months only once. Thus, the area available for each of said names is rather large. That is why the calendar data may be of relatively great dimensions and easy to read.

A simple construction for the adjustment of the mechanism is obtained, when the recess in the periphery of the fixed disc is provided at its inlet end with an arcuate slot, which is concentric to the axis of the discs and has substantially the same radius as the number disc, said slot thus leaving a tooth of the month disc uncovered, when the latter is in a position in which its teeth are covered within the active path of the catch. In that case the month disc must have, immediately behind the abutting edges of its teeth, a diameter which is at least equal to that of the number disc. The catch being in the recess of the fixed disc will penetrate said slot, when the driving arm is swung backwards. Owing thereto the catch is brought behind the tooth of the month disc, which is left uncovered by said slot. When thereupon the driving arm is swung forwards again, the month disc is advanced without moving the number disc, for the diameter of the latter is too small for establishing a coupling between the number disc and the catch.

The invention makes it possible to arrange the coupling members of the number disc and the month disc on a concentric circle within the areas of the discs. This means that said discs may be constructed as rings, which are rotatably mounted round a fixed ring attached to the dial-plate. In that case a rotary toothed disc for indicating the phases of the moon may be provided within said fixed ring and said toothed disc may be covered by a fixed plate provided with a recess, which leaves only some of the teeth of the toothed disc uncovered, said toothed disc being adapted to be moved through a predetermined angle by a second catch carried by the driving arm and guided by the periphery of said fixed plate.

For the elucidation of the invention reference is made to the accompanying drawing, in which:

Fig. 1 is, on a large scale, a plan view of the back of the important part of the calendar mechanism,

Fig. 2 is a sectional view taken on the line II—II in Fig. 1,

Fig. 3 is, on a smaller scale, a plan view of the back of the dial-plate of said calendar mechanism,

Fig. 4 is a plan view of the back of the disc carrying the names of the days of the week, the so-called day disc,

Fig. 5 is a plan view of the back of an intermediate ring,

Fig. 6 is a plan view of the back of the disc carrying the names of the months, the so-called month disc,

Fig. 7 is a plan view of the back of the fixed disc provided with a guiding track, and

Fig. 8 is a plan view of the back of the disc carrying the date numbers, the so-called number disc.

A driving arm **3** is mounted for oscillation about a bushing **2**, which is attached to the dial-plate and through which the shafts (not shown) of the hands of a clockwork may be passed. In the present case said driving arm is driven by a pin **4** provided on a wheel (not shown), which is rotated by a clockwork with the speed of one revolution per twenty-four hours. Thus, the driving arm **3** is swung to and fro through a predetermined angle once a day. Provided at the end of the driving arm is a catch **5**, **6** which, during the reciprocation or the oscillation of the driving arm **3**, slides with its pin **6** along the edge or wall of a recess provided on the periphery of the fixed annular disc **7** (Fig. 7) and is kept in contact with said recess by a spring **8**.

Mounted in succession on an annular hub **9** attached

to the dial-plate **1** are an annular rotary disc **10** carrying the names of the days and having seven equidistanced equal teeth **11** (Fig. 4), a fixed intermediate ring **12** (Fig. 5), an annular rotary disc **13** carrying the names of the months and having twelve equidistanced equal teeth **14** (Fig. 6), the fixed annular disc **7** (Fig. 7) having the guiding track for the catch **5**, **6** and an annular rotary disc **15** carrying the date numbers and having thirty-one teeth (Fig. 8), of which the teeth **16**, **17**, **18** are angularly distanced by angles of 9° and the remaining teeth **19** are angularly spaced apart by angles of 333°/28.

The dial-plate **1** is provided with windows **20**, **21**, **22** into which the names of the days, the date numbers and the names of the months are brought, respectively. The day disc **10** is provided with recesses **23**, which correspond to the windows **21** and **22**. The month disc **13** has recesses **24**, which register with the window **21** and the fixed disc **7** has a window **25**, which lies behind the window **21**. It will be clear that said recesses in the discs are necessary for making the calendar data visible in the windows **20**, **21** and **22**.

The day disc **10**, the month disc **13** and the number disc **15** have different diameters, so that the diameter of the day disc **10** is greater than that of the month disc and the diameter of the latter is greater than that of the number disc. The edge of the recess provided on the periphery of the fixed disc **7**, along which edge the pin **6** of the catch **5**, **6** is moved, lies, through an arc *a* (Fig. 1), which is greater than $\frac{1}{7}$ but smaller than $\frac{2}{7}$ of a complete circle, at a distance smaller than the radius of the day disc from the axis of rotation of the discs, so that within said arc the teeth of the day disc **10** are left uncovered by the fixed disc **7**. Further, the shape of the recess of the disc **7** is such, that the teeth of the number disc **15** are left uncovered within the arc *b*, which is greater than 9° but smaller than 18°, whereas the teeth of the month disc **13** project from the edge of the recess of the fixed disc within an arc *c*, which is smaller than 30°, and an adjacent arc *d* of exactly 30°. At the point **26** between the arcs *c* and *d* the distance of the edge of said recess to the axis of rotation is equal to the radius of the month disc, so that at that point the abutting edge of a tooth **14** of the month disc **13** will be inaccessible for the pin **6** of the catch. Within the arc *d* of 30° the teeth of the number disc **15** remain covered.

It will be apparent that, if the driving arm **3** is swung counter-clockwise from the position shown in Fig. 1, the pin **6** of the catch **5**, **6** is moved from the finger-shaped protrusion **27** of the disc **7** and is drawn by the spring **8** against the edge or wall of the recess on the periphery of said disc. Said pin will then engage one of the teeth **11** of the day disc **10** and the number disc **15**, respectively. When the pin **6** is moved to part **28** of the fixed disc **7** the day disc and the number disc will be rotated one step. Since none of the teeth of the month disc project from the profile of the recess of the fixed disc **7** said disc will not be advanced. During the return stroke of the driving arm the pin **6** is guided on the outside of a resilient guiding strip **29**, which is attached to the dial-plate **1** and prevents the pin **6** from coming into contact with the next tooth of the day disc and with the next one of the number disc, whereby the calendar mechanism could be disarranged.

After the number of the last day of the month in question has been shown in the window the month disc will have to be advanced one step during the next active stroke of the driving arm and the number disc must bring its number 1 into the window. For this purpose the month disc and the number disc can be interconnected by means of a pin **31** which is loaded by a spring **30** and is secured to the number disc **15**. Said pin can be passed through an opening **32** in the number disc and a slot **33** in the fixed disc **7** and be introduced in one of the holes **34**, **35** . . . **46**, which are provided in the month disc and

lie on a circle round the axis of rotation. The slot **33** in the fixed disc **7** is provided with an inlet edge **47** and an outlet edge **48**. The spring **30** is so constructed that by engaging said outlet edge **48** it pulls the pin **31** out of one of the holes **34** . . . **46**, whereby the coupling between the number disc **15** and the month disc **13** is broken.

The slot **33** extends between the inlet edge **47** and the outlet edge **48** through an arc of 33°. The holes **34** . . . **46** are so positioned that, when a month having thirty-one days is shown in the window (in Fig. 1 the month of December) the hole **34, 37, 39, 41, 42, 44** or **46** (in Fig. 1 the hole **46**) of the month disc lies under the slot **33** at a distance of 3° from the outlet edge **48**. In that case the pin **31** will engage said hole, when the catch **6** moves the number disc **15** from the number 31 to the number 1. The interconnection of the number disc and the month disc takes place 3° before the advance of the number disc is completed. Due to this coupling between the two discs referred to the month disc is driven by the number disc through an arc of 3°. The result thereof is that the tooth **14** of the month disc **13**, said tooth lying right under the point **26** of the edge of the recess of the fixed disc **7**, is moved into the range of arc *d*, and thus comes into the open, so that it can be engaged by the catch **5, 6**. After the number disc has been brought on the number 1 the driving arm moves on and during its further travel it advances the month disc one step. In the months having thirty days the hole **38, 40, 43** or **45** lies at a distance of 3°+333°/28 from the outlet edge **48** of the slot, so that the pin **31** already engages said hole during the advance of the number disc from the number 30 to the number 31. During this movement of the number disc the month disc is again advanced through an arc of 3°. This has the result that the month disc can be engaged by the catch **5, 6** and advanced one step again. During the advance of the month disc the number disc, which is still coupled with the month disc, is driven by said month disc through a further arc of 333°/28, which arc corresponds with one more step. Consequently, the number disc is advanced to the number 31 during the first part of the stroke of the driving arm.

Said disc is brought from the number 31 to the number 1 during the second part of said stroke and the month disc is advanced one step also during said second part of the stroke. The month disc has two holes **35, 36** for the month of February. In the said month these holes lie at a distance of 3°+18°=21° and 3°+27°=30° from the outlet edge **48**, respectively. The teeth **16, 17, 18** for the advance of the number disc from the numbers 29, 30 and 31 to the numbers 30, 31 and 1, respectively, are spaced apart by angles of 9°, so that during the advance of the number disc from the number 28 to the number 29 the month disc is first moved through an arc of 3° and during the further travel of the driving arm, during which travel the month disc is brought from February to March, the number disc is advanced through an arc of 27°, that means through three numbers, so that after this advance the number disc will show its number 1 in the window. Although the angular distances between the numbers 29, 30, 31 and 1 are 9° and those between the remaining numbers are 333°/28. This irregularity of the distribution of the numbers on the number disc will not be observed from the outside, when the window **21** extends through an arc of about 9°.

In normal years the pin **31** engages the hole **36** of the month disc after the last day of the month of February is finished. In a leap year, however, the pin **31** engages the hole **35**, since the hole **36** is covered by the long arm **49** of the rotatable cross, known per se, which is rotated each year through one quarter of a revolution by the pin **50** of the month disc. When the pin **31** engages the hole **35** the advance of the month disc takes place after the 29th day of February and the number disc

will be moved by the month disc through an arc of 18°, that means two numbers after it has been brought onto the number 30. Also in that case the number disc will show its number 1 in the window after the change of the months has been completed.

For the adjustment of the mechanism by hand the driving arm **3** is provided with a grip **51**. When the driving pin **4** of the clockwork is situated outside the recess **52** of the arm **3** it can be swung to and fro freely between two end positions. At the inlet end of the recess of the fixed disc **7** an arcuate slot **53** is provided, which has a radius equal to that of the number disc. This slot does not affect the number disc but it leaves the teeth of the month disc uncovered. The length of the arc of said slot is so chosen that the pin **6** is able to engage a tooth **14** of the month disc after it has been dropped from the finger-shaped protrusion **27** and thereupon is moved backwards. This backward movement must take place before the pin **6** has passed the free end of the resilient guiding strip **29**. Should the driving arm be returned after the pin **6** has passed said strip, the pin of the catch will be moved along the outside of said strip, so that it is returned onto the outer edge of the protrusion **27**. Behind the abutting edges of its teeth **14** the month disc has a diameter which is at least equal to that of the number disc, so that, when the pin **6** engages such a tooth **14**, it cannot engage a tooth of the number disc anymore. In that way the month disc may be adjusted after the day disc is moved a little.

The adjustment of the mechanism is carried out as follows:

Assuming that the calendar mechanism shows Wednesday the 12th October, but that the real date is Sunday the 27th December, the driving arm is first moved to and fro through its entire stroke until Saturday appears in the window. This means that the day disc is advanced three steps. Since in that case the number disc also has been advanced three steps the window will show the number 15. Thereupon the arm **3** is swung counter-clockwise sufficiently to have the pin **6** dropped from the protrusion **27** and then the arm is moved backwards, so that the pin **6** penetrates the slot **53** and engages a tooth **14** of the month disc. When the driving arm **3** is again swung to and fro, so that the pin **6** does not pass the end of the resilient guiding strip **29**, the month disc will be advanced one step during each reciprocation of the driving arm. In the present case the driving arm has to be reciprocated only twice in order to get the month of December in the window. During this manipulation the day disc has come into a position intermediate Saturday and Sunday. After the adjustment of the month disc the pin **6** is swung to and fro within the arc *b*, so that during each forward stroke of the driving arm the number disc is shifted one step. Also this disc will be adjusted, when it has brought its number 27 into the window. When after the last forward stroke of the driving arm the latter is moved towards the end of its stroke the day disc is adjusted on Sunday. Finally the driving arm **3** is returned to its starting point, so that, when the calendar mechanism has been adjusted, the clockwork is able to take over the driving of said mechanism.

Within the fixed ring **9** a toothed disc **54** for indicating the phases of the moon is mounted on the bushing **2**. This disc moves the image of the moon behind a crescent-shaped window **55** of the dial-plate **1** and it is driven during each stroke of the driving arm **3** by a resilient hook **56** secured to said driving arm. The angle of this advance is determined by the recess **57** in a fixed plate **58**, which covers the toothed disc **54**.

What I claim is:

1. A calendar mechanism comprising a driving arm mounted for swinging back and forth movement, a catch on said arm, a rotatable day disc having seven equi-spaced teeth, a rotatable month disc having 12 equi-spaced teeth, a rotatable date disc having 31 equi-spaced

teeth, three successive teeth of said date disc being equi-spaced by angles of less than 10 degrees, the remaining teeth of said date disc being equi-spaced by angles of more than 10 degrees, said discs being arranged in superposed relation with respect to each other and having their teeth movable into the path of and engageable by said catch to effect rotation of said discs, the diameter of said day disc being greater than that of said month disc and the diameter of the latter being greater than that of said date disc, a fixed disc having a segmental portion of greater radius than that of said day disc, the peripheral edge of said segmental portion providing a track for guiding movement of said catch in its working direction, said peripheral edge being formed with a recess such that the teeth of the day disc are left uncovered by the fixed disc through an arc *a* extending through an angle of $\frac{2}{7} \times 360°$ at the most and that within said arc the teeth of the date disc are left uncovered through an arc *b* extending through twice the angle between the teeth which are angularly spaced apart less than 10 degrees, at the most, and the teeth of the month disc are left uncovered through two arcs *c*, *d* of 30° at the most, which join each other or are spaced apart by an arc of 30°, so that said catch when moving along the edge of said recess engages at least a tooth of each of the day and date discs to advance said discs one step, there being holes formed in said month disc arcuately spaced about the axis of said disc in accordance with the number of days in the month, a spring loaded pin carried by said date disc and periodically engageable in each of said holes for coupling said month and date discs together, said month disc thus being movable with said date disc so that one of the month disc teeth projects into the path of the catch within

the arc *d* of the track on said fixed disc portion, whereby movement of said catch serves to engage said one month disc tooth to complete the month disc step, said date disc being carried along with said month disc to complete a revolution when the month being completed has less than 31 days.

2. A device according to claim 1, wherein the peripheral recess of said segmental portion is provided at its inlet with an arcuate slot concentric with the axis of the discs and of substantially the same radius as said date disc, said slot leaving a tooth of the month disc uncovered when said disc is in a position in which none of its teeth is left uncovered within the working path of the catch, said month disc having immediately behind the working edges of its teeth a diameter which is at least equal to that of the date disc.

3. A device according to claim 1, said rotary discs being annular in configuration, an additional rotary tooth disc disposed concentrically of and within said day, month and date discs for indicating moon phases, a fixed plate over said last named toothed disc and having a recess exposing some of the teeth, and a second catch on said arm guided by the peripheral recess of said plate for driving said last named toothed disc.

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