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(54) TIMEPIECE DEVICE FOR THE DISPLAY OF THE DURATION OF DAY AND NIGHT

UHRVORRICHTUNG ZUR ANZEIGE DER DAUER VON TAG UND NACHT

DISPOSITIF D'HORLOGERIE POUR L'AFFICHAGE DE LA DURÉE DU JOUR ET DE LA NUIT

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Description

[0001] The invention concerns a device, typically a timepiece device, indicating the duration of the day and the duration of the night.

[0002] In most cases, in this kind of devices, sunrise (or sunset) times are displayed by means of a mechanism palpating a cam whose shape takes into account latitude, longitude and UTC time, said cam expressing, at each point of its circumference, the value associated with the time of sunrise (or sunset) for a given day of the year. The mechanism described in patent CH690516 uses this type of cam. However, in such mechanisms, the cam is associated with a specific latitude. Therefore, the values indicated are no longer correct when the latitude changes. In order to change the latitude setting it would be necessary to change the shape of the cam.

[0003] The patent application CH 712 374 A1 discloses a device indicating sunrise and sunset times at a given latitude using a different mechanism. In this device, the latitude is selected by the watchmaker when assembled. Therefore, like in the previously presented device, the user can not set the latitude whenever he wants, for example when he travels. Indeed, in order to modify the latitude setting, it is necessary to modify the assembly of the mechanism's organs.

[0004] The invention aims at providing a timepiece device for displaying the duration of day and night that allows a correct display for every possible latitude.

[0005] For this purpose, the invention proposes a timepiece device comprising a driving member, a transmission element and a display device, said driving member being intended to pivot about an axis at a speed of one revolution per year and comprising a latitude pin at a distance r from said axis and a latitude setting device for setting the value of the distance r, each value of r corresponding to a defined value of latitude and remains fixed once its setting has been made, said latitude pin cooperating with a means of cooperation of the transmission element for driving the latter in alternating movements, at least a part of the transmission element being guided in translation, the part of the transmission element being guided in translation comprising at least a first and a second portions kinematically connected respectively to a first and a second elements of the display device, said first and second elements being arranged to display the duration of the day and the duration of the night, said timepiece device comprising a control organ, said control organ typically comprising a latitude crown, for setting the latitude, and characterized in that in that said latitude setting device comprises : a wheel having an external gear and pivoting about said axis ; a ring, having both internal and external toothing and being coaxial to the wheel ; a stud, parallel to said axis, fixedly mounted on the wheel and eccentric by a distance d1 from said axis, the distance d1 corresponding to half of the distance d2 separating said axis from the internal toothing of the ring; and a pinion of radius d1, free to rotate about the stud, said pinion carrying, on its outer perimeter, the latitude pin and meshing with the internal toothing of the ring ; all arranged so that, when setting the latitude, it is possible to rotate the wheel relative to the ring in order to set the distance r, r being between 0 and d2.

[0006] The invention also proposes a timepiece, such as a pocket watch or a wristwatch, comprising a clockwork movement and such a timepiece device.

[0007] In the context of this invention, "night" is defined as the time from dusk to dawn and "day" is defined as the time from dawn to dusk.

Figure 1 illustrates the display of a timepiece comprising a timepiece device according to a particular embodiment of the invention, set for a latitude of 48° north, on March 21st.
Figure 2 illustrates the display of the timepiece of figure 1 on June 21st.
Figure 3 illustrates the display of the timepiece of figure 1 on September 21st.
Figure 4 illustrates the display of the timepiece of figure 1 on December 21st.
Figure 5 is a perspective view of the timepiece device of figure 1.
Figure 6 illustrates, in a view from above, a driving member isolated from the device of figure 5.
Figures 7a to 7f illustrate, in a view from above, the driving member of figure 6 in positions corresponding to different latitude settings, respectively corresponding to a latitude of 90°North (figure 7a), a sequence showing the possible values of latitude between 90° North and 90° South (figures 7b - 7e), and to a latitude of 90° South (figure 7f).
Figures 8a to 8h are perspective views of the device of figure 5 at different dates of the year, respectively December 21st, February 21st, March 21st, April 21st, June 21st, August 21st, September 21st and November 21st, for a latitude setting of 90°N.
Figures 9a to 9d are perspective views of the device of figure 5 at different dates of the year, respectively December 21st, March 21st, June 21st, and September 21st, for a latitude setting of 45°North.

[0008] As previously mentioned, figures 1 to 4 illustrate the display of a timepiece comprising a timepiece device 1 according to a particular embodiment of the invention.

[0009] The timepiece of figure 1 comprises, among other things, a dial 30 comprising several indications 2, 5, 7, 10, hands 6, 8, 9 and a day/night display device which is a part of the timepiece device 1.

[0010] With reference to these figures 1 to 4, the day/night display device comprises a first 3 and a second 4 day/night

display elements arranged to display the duration of the day and the duration of the night. Said first 3 and second 4 display elements are intertwined cut rings, corresponding respectively to a night cut ring 3 and to a day cut ring 4. Both the night cut ring 3 and the day cut ring 4 have the shape of a dextral circular helix whose length is equal to one pitch, as shown in figure 5 but they could be longer.

[0011] Alternatively, both the night cut ring 3 and the day cut ring 4 may have the shape of a sinister circular helix.

[0012] Other shapes for the day/night display devices are possible.

[0013] Said cut rings 3, 4 are intertwined with the result of a visible night cut ring portion 3a and a visible day cut ring portion 4a. The lengths of said visible portions 3a, 4a depend on both the latitude and the day of the year, and respectively indicate the duration of the night and the duration of the day.

[0014] Advantageously, the night cut ring 3 is dark in color, typically blue and the day cut ring 4 is light in color, typically yellow. Alternatively, said cut rings 3, 4, can be of any color from the moment they are visually distinguishable from each other.

[0015] Preferably, the cut rings 3, 4 are divided into hours sections, and respectively comprise indications of duration 3b, 4b corresponding to numbers from one to twenty-four. With these indications 3b, 4b, the duration of the day and the duration of night can easily be read on the cut rings 3, 4.

[0016] The timepiece whose display is shown in figures 1 to 4 comprises a traditional hour scale comprising hour indexes 5 from one to twelve for the indication of the hour via a traditional hour hand 6. A traditional minute hand 9 makes it possible to read the minutes on graduations of the minutes 10 on the dial 30.

[0017] Said timepiece also comprises an additional twenty-four hour scale comprising additional hour indexes 7. This scale make it possible to read the hours of sunrise and sunset times. Indeed, as shown in figures 1 to 4, at the junctions of the two cut rings 3, 4, the hours of sunrise and sunset can be read on the twenty-four hour scale.

[0018] Advantageously, the time can also be read on this twenty-four hour scale by means of an additional twenty-four hour hand 8.

[0019] We can consider that said additional twenty-four hour hand 8 represents the sun. If the twenty-four hour-hand 8 is in within the dark section 3b, it is nighttime, and if it is within the light section 4b, it is daytime. When the twenty-four-hour-hand 8 is at the junctions of the two cut rings 3, 4, sunrise or sunset occurs.

[0020] In figures 1 to 4, the timepiece device 1 is set for a latitude of 48°, as shown by the latitude indication 2 which is visible through an aperture in the dial 30. The display of the timepiece of figure 1 indicates in two other dial 30 apertures both the date and the month.

[0021] The display of the timepiece of figure 1 indicates that, at a latitude of 48°, on March 21st, the length of the day is around twelve hours and the length of the night is also around twelve hours. It can also be read that the sunrise occurs at around 6 o'clock and the sunset occurs at around 18 o'clock. Indeed, the junctions of the two cut rings 3, 4 are in front of the additional hour indexes 7 "6" and "18". The display indicates 8:33 pm. Indeed, the traditional hour 6 and minute 9 hands indicate 8:33 and the additional hour hand 8 indicates around 20:30, showing that it is an hour of the night. Moreover, the display shows that the night began about two and a half hours ago (the additional hand 8 is in front of the dark part of the ring, in the middle of the hour section having the indication of duration 3b "3").

[0022] The display of the timepiece of figure 2 shows that, on June 21st, sun rises at around 4:15 a.m and sunset is at around 8:15 p.m. The dial is represented at 6:52 p.m. The length of the day is around 16 hours and the length of the night is around 8 hours; the additional hour hand 8 indicates around 18:50 (figure 2).

[0023] The display of the timepiece of figure 3 shows that, on September 21st, sun rises at around 6 a.m and sunset is at around 6 p.m. The dial 30 is represented at 6:55 p.m. The length of the day is around 12 hours and the length of the night is around 12 hours (figure 3).

[0024] The display of the timepiece of figure 4 shows that, on December 21st, sun rises at around 8 a.m and sunset is at around 4:20 p.m. The dial is represented at 6:54 p.m. The length of day is around 8 hours and 20 minutes and the length of night is around 15 hours and 40 minutes (figure 4).

[0025] As shown in figure 5, the timepiece device 1 comprises a driving member 11, a transmission element 17, two multiplier gear trains 19a, 19b and the day/night display device.

[0026] The driving member 11 is intended to be rotated about an axis 100 at a speed of one revolution per year. It comprises a latitude pin 16 at a distance r from said axis 100 and a latitude setting device for setting the value of the distance r. Indeed, to each value or r corresponds a latitude value.

[0027] When the latitude setting is done, the value of r is fixed and the latitude pin 16 thus describes a circle C whose radius r depends on the preselected latitude, revolving one revolution per year.

[0028] The latitude pin 16 cooperates with a slot 18 of the transmission element 17 in which it is inserted, it is slidable inside said slot 18. The slot 18 extends along a straight line. Thanks to this cooperation, the latitude pin 16 drives the transmission element 17 in alternating movements whose amplitude depends on the value of r and therefore on the latitude. The driving member 11 and the latitude pin 16 constitute a crank for driving the transmission element 17.

[0029] The transmission element 17 comprises a first 17a and a second 17b portions kinematically connected respectively to the first 3 and to the second 4 elements of the day/night display device, respectively via a first multiplier gear

train 19a and a via a second multiplier gear train 19b, so that the day/night display device displays the duration of the day and the duration of the night.

[0030] In the timepiece device 1, the first 17a and second 17b portions of the transmission element 17 respectively comprise a first and a second racks.

[0031] The first rack of the transmission element meshes with a first gear wheel 20a of the first multiplier gear train 19a, said first multiplier gear train 19a causing the first element 3 of the day/night display device to move. The first multiplier gear train 19a comprises the first gear wheel 20a, a pinion 21a that meshes with said first gear wheel 20a and rotates around an axis 200a, and a second gear wheel 22a which is coaxial and fixed in rotation with the pinion 21a, said second gear wheel 22a meshing with an internal toothing of the first element 3 of the day/night display device.

[0032] Similarly, the second rack of the transmission element 17 meshes with a first gear wheel 20b of a second multiplier gear train 19b, said second multiplier gear train 19b causing the second element 4 of the day/night display device to move. The second multiplier gear train 19b comprises the first gear wheel 20b, a pinion 21b that meshes with said first gear wheel 20b and rotates around an axis 200b, and a second gear wheel 22b which is coaxial and fixed in rotation with the pinion 21b, said second gear wheel 22b meshing with an internal toothing of the second element 4 of the day/night display device.

[0033] Said first 17a and second 17b portions of the transmission element 17 are guided in translation in a direction T perpendicular to that in which the slot 18 extends, by the first and second multiplier gear trains 19a, 19b, as illustrated in figure 5. In the particular embodiment described above, thanks to the slot 18 that extends along a straight line in which the latitude pin 16 is slidable, the entire transmission element 17 can move according to a translation movement.

[0034] As mentioned before, the driving member 11 comprises a latitude pin 16 at a distance r from the axis 100 and a latitude setting device for setting the value of the distance r.

[0035] Figure 6 shows the driving member 11 isolated. As shown in this figure 6, the latitude setting device comprises: a geared wheel 12 pivoting about the axis 100, a ring 13 having both internal and external toothing and being coaxial to the wheel 12, a stud 15 and a pinion 14.

[0036] The stud 15 is parallel to the axis 100 and fixedly mounted on the wheel 12. It is eccentric of its axis of rotation 100 by a distance d1. Said distance d1 corresponds to half of the distance d2 separating said axis 100 from the internal toothing of the ring 13.

[0037] The pinion 14 has a radius corresponding to d1 and is free to rotate around the stud 15. It carries, on its outer perimeter, the latitude pin 16 and meshes with the internal toothing of the ring 13.

[0038] The position of the stud 15 on the wheel 12 and the dimensions of the pinion 14 are designed so that the toothing of the pinion 14 meshes continuously with the internal toothing of the ring 13.

[0039] The pinion 14 carries the latitude pin 16 on its circumference, as shown for example in figure 6.

[0040] The ring 13 is frictionally mounted on the wheel 12 so that they rotate together except when setting the latitude.

[0041] For the setting of the latitude, the ring 13 and the wheel 12 have to be moved in rotation one relative to each other. The relative displacement of the wheel 12 with respect to the ring 13 causes the rotation of the pinion 14 along the internal toothing of the ring 13 and results in the variation of the previously defined distance r, r being comprised between 0 and d2.

[0042] The ratio of dimensions between the diameter of the pinion 14 and the diameter of the inner toothing of the ring 13 causes, when the wheel 12 is pivoted with respect to the ring 13, the latitude pin 16 to move along a straight line (d) passing by the axis 100. The position of the latitude pin 16 along said line (d) sets the latitude.

[0043] In the timepiece device 1, the external toothing of the ring 13 is intended to be kinematically connected to the going train of a clockwork movement in order to be continuously rotated around its axis of rotation 100 at a speed of one revolution per year. As indicated before, most of the time, the ring 13 also rotates the wheel 12 at a speed of one revolution per year. But, during the setting of the latitude, the wheel 12 is able to be rotated relative to the ring 13 by means of a control organ comprising a latitude crown (not represented) and kinematically connected to its toothing, said control organ being set to be actualized by the user.

[0044] Alternatively, the setting of the latitude may be done by any convenient control organ.

[0045] Figures 7a to 7f illustrate the behavior of the driving member 11 during the setting of the latitude. As mentioned before, during the setting of the latitude, the wheel 12 rotates relatively to the ring 13.

[0046] As the ring 13 rotates at a speed of one revolution per year, it can be considered as motionless during the setting of the latitude.

[0047] The "starting position" illustrated in figure 7a, where the latitude pin 16 is on the circle defined by the circumference of the inner toothing of the ring 13, corresponds to a setting of a latitude of 90° North. By definition, it also corresponds to an angle of rotation of the wheel 12 relative to the ring 13 of 0°.

[0048] When the wheel 12 is rotated of 90° clockwise relatively to the ring 13, starting from the previously defined "starting position", the position of the latitude pin 16 coincides with the center of the wheel 12 that is crossed by the axis 100, it corresponds to a setting of a latitude of 0° (figure 7d).

[0049] When the wheel 12 is rotated of 180° clockwise relatively to the ring 13, starting from the previously defined

"starting position", the latitude pin 16 is on the circle defined by the circumference of the inner toothing of the ring 13 and corresponds to a setting of a latitude of 90°South (figure 7f).

[0050] Table 1 hereunder shows the correspondences between the angles of rotation of the wheel 12 relative to the ring 13 and the latitude set values.

Table 1:

Angle of rotation of the ring 13 relative to the wheel 12	0°	90°	180°
Latitude	90° N	0°	90° S
Corresponding figure	7a	7d	7f

[0051] When the latitude setting is completed, the distance r is fixed. Then, the wheel 12 rotates again in solidarity with the ring 13, and the latitude pin 16 of the driving member 11 thus rotates at a speed of one revolution per year, describing a circle C whose radius r depends on the preselected latitude (figures 8a to 8h).

[0052] As explained before, said latitude pin 16 then drives the transmission element 17 in alternating translational movements whose amplitude is all the greater as the latitude is extreme (close to the poles). These alternating movements are, through the multiplier gear trains, transmitted to the day/night display device in order to display the durations of the day and the night.

[0053] There are two extreme cases.

[0054] In the first extreme case, the latitude pin 16 is located in the center of the wheel 12 (figure 7d) and the transmission element 17 never moves (equator). In that case, the cut rings 3, 4 always indicate twelve hours of day and twelve hours of night.

[0055] In the second extreme case, the latitude pin 16 coincide with the internal toothing of the toothed ring 13. In that case, the transmission element 17 moves in translation from a first extreme high position in which only the night part of the rings is visible (constant night; see. figure 8a) towards a second extreme low position in which only the day part of the rings is visible (constant day, see. figure 8e).

[0056] As mentioned before, figures 8a to 8h are perspective views of the watchmaking device 1 at different dates of the year, for a latitude setting of 90°N.

[0057] Figure 8a shows that, on the 21st of December, at a latitude of 90°N, only the dark cut ring 3 of the device is visible, it is constant night. December, 21st marks the beginning of the winter. The south pole of the earth directs towards the sun, the North Pole directs away from the sun. Every position on earth on a latitude between 66° north (arctic circle) and 90° north (north pole) in the northern hemisphere has twenty-four hours nighttime (winter). Every position on earth on a latitude between 66° south (antarctic circle) and 90° south (south pole) in the southern hemisphere has twenty-four hours daylight (summer). Every position on earth on a latitude between 23.5° north (tropic of cancer) and 23.5° south has twelve hours daylight and twelve hours nighttime.

[0058] Figure 8b shows that, on the 21st of February, at a latitude of 90°N, the dark cut ring 3 is more visible than the light cut ring 4 which means that the night is much longer than the day (around three hours daytime and twenty-one hours nighttime).

[0059] Figure 8c shows that, on the 21st of March, at a latitude of 90°N, the visible part 3a of the dark cut ring 3 is as big as the visible part 4a of the light cut ring 4 which means that there are as many hours of day as there are hours of night (twelve hours of night and twelve hours of day). March 21st marks the spring or vernal equinox in the northern hemisphere and the autumnal or fall equinox in the southern hemisphere, this day marks the beginning of spring. Anywhere on the planet, this day has twelve hours daylight and twelve hours nighttime. It means that day and night are equally long.

[0060] Figure 8d shows that, on the 21st of April, at a latitude of 90°N, the light cut ring 4 is more visible than the dark cut ring 3 which means that the day is much longer than the night (around twenty hours daytime and four hours nighttime).

[0061] Figure 8e shows that, on the 21st of June, at a latitude of 90°N, only the light cut ring 4 of the day/night display device is visible, it is constant day. June 21st marks the summer solstice in the northern hemisphere and the winter solstice in the southern hemisphere, which is the day of the year with the most hours of daylight in the northern hemisphere and the fewest hours of daylight in the southern hemisphere. This day marks the beginning of summer. The north pole of the earth directs towards sun, the south pole directs away from the sun. Every position on earth on a latitude between 66° north (arctic circle) and 90° north (north pole) in the northern hemisphere has 24 hours daylight (summer). Every position on earth on a latitude between 66° south (antarctic circle) and 90° south (south pole) in the southern hemisphere has 24 hours nighttime (winter). Every position on earth on a latitude between 23.5° north (tropic of cancer) and 23.5° south (tropic of capricorn) has twelve hours daylight and twelve hours nighttime.

[0062] Figure 8f shows that, on the 21st of August, at a latitude of 90°N, the light cut ring 4 is more visible than the dark cut ring 3 which means that the day is much longer than the night (around twenty hours daytime and four hours

nighttime).

[0063] Figure 8g shows that, on the 21st of September, at a latitude of 90°N, the visible part of the dark cut ring 3 is as big as the visible part of the light cut ring 4 which means that there are as many hours of day as there are hours of night (twelve hours of night and twelve hours of day). September 21st marks the autumnal or fall equinox in the northern hemisphere and the spring or vernal equinox in the southern hemisphere. This day marks the beginning of autumn. This day has twelve hours daylight and twelve hours nighttime: day and night are equally long.

[0064] Figure 8h shows that, on the 21st of November, the dark cut ring 3 is more visible than the light cut ring 4 which means that the night is much longer than the day (around three hours daytime and twenty-one hours nighttime).

[0065] Figures 9a to 9d are perspective views of the same timepiece device 1 at different dates of the year, for a latitude setting of 45°N.

[0066] Figure 9a shows that, on the 21st of December, at a latitude of 45°N, the dark cut ring 3 is more visible than the light cut ring 4 which means that the night is much longer than the day (around eight hours daytime and sixteen hours nighttime).

[0067] Figure 9b shows that, on the 21st of March, at a latitude of 45°N, the visible part 3a of the dark cut ring 3 is as big as the visible part 4a of the light cut ring 4 which means that there are as many hours of day as there are hours of night (twelve hours of night and twelve hours of day), day and night are equally long.

[0068] Figure 9c shows that, on the 21st of June, at a latitude of 45°N, the light cut ring 4 is more visible than the dark cut ring 3 which means that the day is much longer than the night (around sixteen hours daytime and eight hours nighttime).

[0069] Figure 9d shows that, on the 21st of September, at a latitude of 45°N, the visible part a of the dark cut ring 3 is as big as the visible part 4a of the light cut ring 4 which means that there are as many hours of day as there are hours of night (twelve hours of night and twelve hours of day), day and night are equally long.

[0070] As mentioned before, the invention also concerns a timepiece including a device according to the invention, whose display is, for example, as represented in figures 1 to 4. Such a timepiece typically includes a clockwork movement, a winding mechanism, time setting organs and indicator organs (such as a dial or hands).

[0071] Preferably, the control organ of the timepiece device according to the invention can be set from outside of the timepiece for the setting of the latitude.

[0072] It will be apparent to those skilled in the art that the present invention is not limited to the embodiment shown in the figures. For example, it is not limited to a particular shape for the transmission element 17, to a specific shape for the driving member 11 or to a specific day/night display device.

[0073] The racks of the first 17a and second 17b portions of the transmission element 17 that kinematically connect the transmission element 17 respectively to the first 3 and second 4 elements of the day/night display device could be replaced, for example, by toothed structures other than racks, by toothless structures cooperating with other toothless structures like toothless wheels by adhesion or friction or by any other drive structures able to kinematically connect these portions 17a, 17b of the transmission element 17 to the elements 3, 4 of the day/night display device.

[0074] In the particular embodiment described above, the transmission element 17 comprises a slot 18 in which the latitude pin 16 is slidable, so that the entire transmission element 17 can move according to a translation movement. Alternatively, the slot 18 could be replaced by any convenient means of cooperation, for example by a simple hole in which the latitude pin 16 would pivot. In this case only a part of the transmission element 17 comprising the first 17a and second 17b portions would be guided in translation.

[0075] In the particular embodiment described above, the external toothing of the ring 13 is intended to be kinematically connected to the going train of a clockwork movement in order to be continuously rotated around its axis of rotation 100 at a speed of one revolution per year and the wheel 12 is intended to be actuated by a user for the setting of the latitude by means of a control organ kinematically connected to the toothing of the wheel 12. Alternatively, it is possible to train the driving member 11 in rotation at a speed of one revolution per year by acting on the wheel 12 and to set the latitude by acting on the ring 13.

[0076] The timepiece device according to the invention can easily be modified in order to also indicate summer time and winter time. Indeed, in many countries around the world the hour hand has to be moved one hour or a half hour forward or backward at the beginning of spring or autumn (for some locations are also only half hours).

Claims

1. Timepiece device (1) comprising a driving member (11), a transmission element (17) and a display device (3, 4), said driving member (11) being intended to pivot about an axis (100) at a speed of one revolution per year and comprising a latitude pin (16) at a distance r from said axis (100) and a latitude setting device for setting the value of the distance r, each value of r corresponding to a defined value of latitude and remains fixed once its setting has been made, said latitude pin (16) cooperating with a means of cooperation (18) of the transmission element (17) for driving the latter in alternating movements, at least a part of the transmission element (17) being guided in

translation, the part of the transmission element being guided in translation comprising at least a first (17a) and a second (17b) portions kinematically connected respectively to a first (3) and a second (4) elements of the display device, said first (3) and second (4) elements being arranged to display the duration of the day and the duration of the night, said timepiece device (1) comprising a control organ, said control organ typically comprising a latitude crown, for setting the latitude and **characterized in that** said latitude setting device comprises : a wheel (12) having an external gear and pivoting about said axis (100); a ring (13), having both internal and external toothing and being coaxial to the wheel (12); a stud (15), parallel to said axis (100), fixedly mounted on the wheel (12) and eccentric by a distance d1 from said axis (100), the distance d1 corresponding to half of the distance d2 separating said axis (100) from the internal toothing of the ring (13); and a pinion (14) of radius d1, free to rotate about the stud (15), said pinion (14) carrying, on its outer perimeter, the latitude pin (16) and meshing with the internal toothing of the ring (13); all arranged so that, when setting the latitude, it is possible to rotate the wheel (12) relative to the ring (13) in order to set the distance r, r being between 0 and d2.

2. Timepiece device (1) according to claim 1, **characterized in that** said ring (13) is frictionally mounted on the wheel (12) so that they rotate together except when setting the latitude.

3. Timepiece device (1) according to any of claims 1 and 2, **characterized in that** the ring (13) is intended to be continuously driven in rotation at a speed of one revolution per year and **in that** during the setting of the latitude, the wheel (12) is rotated relative to the ring (13) by actuating said control organ.

4. Timepiece device (1) according to any of claims 1 and 2, **characterized in that** the wheel (12) is intended to be continuously driven in rotation at a speed of one revolution per year and **in that**, during the setting of the latitude, the ring (13) is rotated relative to the wheel (12) by actuating said control organ.

5. Timepiece device (1) according to one of the preceding claims, **characterized in that** both said first (3) and second (4) elements are in the form of a circular helix, both dextral or both sinister, each of said first (3) and second (4) elements being of a length at least equal to one pitch, said elements (3, 4) being arranged in such a way that the angular position of one element with respect to the other one leads to the definition of visible portions (3a, 4a) of these elements (3, 4), the length of the visible portions (3a, 4a) of said first (3) and second (4) elements respectively being indicative of the duration of the day and of the duration of the night.

6. Timepiece device (1) according to one of the preceding claims, **characterized in that** said first (17a) and second (17b) portions of the transmission element (17) respectively comprise a first and a second toothing intended to mesh respectively with a first (19a) and a second (19b) multiplier gear trains, these multiplier gear trains (19a, 19b) meshing respectively with a toothing of said first element (3) and with a toothing of said second element (3).

7. Timepiece device (1) according to one of the preceding claims, **characterized in that** said means of cooperation comprise a slot (18), the latitude pin (16) being inserted into said slot (18) and being slidable inside.

8. Timepiece device (1) according to claim 7, **characterized in that** said slot (18) extends in a direction perpendicular to the direction T of the translation movements of the transmission element (17).

9. Timepiece device (1) according to one of claims 6 to 8, **characterized in that** the transmission element (17) is guided in translation by said multiplier gear trains (19a; 19b).

10. Timepiece device (1) according to one of the preceding claims, **characterized in that**, during the setting of the latitude, the latitude pin (16) moves along a straight line (d), said straight line (d) passing by the axis of rotation (100) of the driving member (11).

11. Timepiece such as a pocket watch or a wristwatch comprising a clockwork movement and a timepiece device (1) according to one of claims 1 to 10.

12. Timepiece according to claim 11, **characterized in that** said latitude setting device is operable from outside the timepiece.

13. Timepiece according to claim 11 or 12, **characterized in that** said timepiece comprises a twenty-four hour graduation (7) on or around the dial (30) making it possible to read the hours of sunrise and sunset.

Patentansprüche

1. Uhrvorrichtung (1), die ein Antriebselement (11), ein Übertragungselement (17) und eine Anzeigevorrichtung (3, 4) umfasst, wobei das Antriebselement (11) dazu bestimmt ist, sich mit einer Drehzahl von einer Umdrehung pro Jahr um eine Achse (100) zu drehen, und einen Breitenstift (16) in einem Abstand r von der Achse (100) und eine Breiteneinstellungsvorrichtung zum Einstellen des Werts des Abstands r umfasst, wobei jeder Wert von r einem definierten Breitenwert entspricht und fest bleibt, nachdem seine Einstellung vorgenommen wurde, wobei der Breitenstift (16) mit Zusammenwirkungsmitteln (18) des Übertragungselements (17) zum Antreiben des letzteren in abwechselnden Bewegungen zusammenwirkt, wobei zumindest ein Teil des Übertragungselements (17) translatorisch geführt wird, wobei der Teil des Übertragungselements, der translatorisch geführt wird, mindestens einen ersten (17a) und einen zweiten (17b) Abschnitt umfasst, die kinematisch mit einem ersten (3) beziehungsweise einem zweiten (4) Element der Anzeigevorrichtung verbunden sind, wobei das erste (3) und das zweite Element (4) eingerichtet sind, um die Dauer des Tages und die Dauer der Nacht anzuzeigen, wobei die Uhrvorrichtung (1) ein Steuerorgan umfasst, wobei das Steuerorgan typischerweise eine Breitenkrone zum Einstellen der Breite umfasst, und **dadurch gekennzeichnet, dass** die Breiteneinstellungsvorrichtung umfasst: ein Rad (12), das eine Außenverzahnung aufweist und sich um die Achse (100) dreht; einen Ring (13), der sowohl Innen- als auch Außenzahnung aufweist und koaxial zu dem Rad (12) ist; einen Dübel (15), der parallel zu der Achse (100) ist und fest auf dem Rad (12) montiert ist und um einen Abstand d1 von der Achse (100) exzentrisch ist, wobei der Abstand d1 der Hälfte des Abstands d2 entspricht, der die Achse (100) von der Innenzahnung des Rings (13) trennt; und einen Trieb (14) mit dem Radius d1, der um den Dübel (15) frei drehbar ist, wobei der Trieb (14) auf seinem Außendurchmesser den Breitenstift (16) trägt und mit der Innenzahnung des Rings (13) ineinandergreift; wobei alles derart eingerichtet ist, dass es beim Einstellen der Breite möglich ist, das Rad (12) in Bezug auf den Ring (13) zu drehen, um den Abstand r einzustellen, wobei r zwischen 0 und d2 beträgt.

2. Uhrvorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Ring (13) derart reibend an dem Rad (12) montiert ist, dass sie sich bis auf beim Einstellen der Breite miteinander drehen.

3. Uhrvorrichtung (1) nach einem der Ansprüche 1 und 2, **dadurch gekennzeichnet, dass** der Ring (13) dazu bestimmt ist, ununterbrochen mit einer Drehzahl von einer Umdrehung pro Jahr angetrieben zu werden, und dadurch, dass während des Einstellens der Breite das Rad (12) durch Betätigen des Steuerorgans in Bezug auf den Ring (13) gedreht wird.

4. Uhrvorrichtung (1) nach einem der Ansprüche 1 und 2, **dadurch gekennzeichnet, dass** das Rad (12) dazu bestimmt ist, ununterbrochen mit einer Drehzahl von einer Umdrehung pro Jahr drehbar angetrieben zu werden, und dadurch, dass während des Einstellens der Breite der Ring (13) durch Betätigen des Steuerorgans in Bezug auf das Rad (12) gedreht wird.

5. Uhrvorrichtung (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sowohl das erste (3) als auch das zweite (4) Element die Form einer kreisförmigen Schraubenlinie aufweisen, die beide rechtsseitig oder beide linksseitig sind, wobei jedes von dem ersten (3) und dem zweiten (4) Element eine Länge von mindestens gleich einer Teilung aufweist, wobei die Elemente (3, 4) derart eingerichtet sind, dass die Winkelposition von einem Element in Bezug auf das andere zur Definition von sichtbaren Abschnitten (3a, 4a) dieser Elemente (3, 4) führt, wobei die Länge der sichtbaren Abschnitte (3a, 4a) des ersten (3) beziehungsweise zweiten (4) Elements die Dauer des Tages beziehungsweise die Dauer der Nacht angeben.

6. Uhrvorrichtung (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der erste (17a) und der zweite Abschnitt (17b) des Übertragungselements (17) eine erste beziehungsweise eine zweite Zahnung aufweisen, die dazu bestimmt sind, mit einem ersten (19a) beziehungsweise einem zweiten (19b) Übersetzungsgetriebezug ineinanderzugreifen, wobei diese Übersetzungsgetriebezüge (19a, 19b) mit einer Zahnung des ersten Elements (3) beziehungsweise mit einer Zahnung des zweiten Elements (3) ineinandergreifen.

7. Uhrvorrichtung (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Zusammenwirkungsmittel einen Spalt (18) umfassen, wobei der Breitenstift (16) in den Spalt (18) eingesetzt ist und darin verschiebbar ist.

8. Uhrvorrichtung (1) nach Anspruch 7, **dadurch gekennzeichnet, dass** der Spalt (18) sich in einer Richtung senkrecht zur Richtung T der Translationsbewegungen des Übertragungselements (17) erstreckt.

9. Uhrvorrichtung (1) nach einem der Ansprüche 6 bis 8, **dadurch gekennzeichnet, dass** das Übertragungselement (17) durch die Übersetzungsgetriebezüge (19a; 19b) translatorisch geführt wird.

10. Uhrvorrichtung (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** während des Einstellens der Breite der Breitenstift (16) sich entlang einer geraden Linie (d) bewegt, wobei die gerade Linie (d) durch die Drehachse (100) des Antriebselements (11) verläuft.

11. Uhr, wie beispielsweise Taschenuhr oder Armbanduhr, die ein Uhrwerk und eine Uhrvorrichtung (1) nach einem der Ansprüche 1 bis 10 umfasst.

12. Uhrvorrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** die Breiteneinstellungsvorrichtung von außerhalb der Uhr betätigt werden kann.

13. Uhrvorrichtung nach Anspruch 11 oder 12, **dadurch gekennzeichnet, dass** die Uhr eine Vierundzwanzig-Stunden-Teilung (7) auf dem oder um das Zifferblatt (30) herum umfasst, wodurch es ermöglicht wird, die Uhrzeiten des Sonnenaufgangs und Sonnenuntergangs abzulesen.

Revendications

1. Dispositif d'horlogerie (1) comprenant un élément d'entraînement (11), un élément de transmission (17) et un dispositif d'affichage (3, 4), ledit élément d'entraînement (11) étant prévu pour pivoter autour d'un axe (100) à une vitesse d'un tour par an et comprenant une goupille de latitude (16) à une distance r dudit axe (100) et un dispositif de réglage de latitude pour régler la valeur de la distance r, chaque valeur de r correspondant à une valeur de latitude définie et restant fixe une fois que son réglage a été effectué, ladite goupille de latitude (16) coopérant avec des moyens de coopération (18) de l'élément de transmission (17) pour entraîner celui-ci dans des mouvements alternatifs, au moins une partie de l'élément de transmission (17) étant guidée en translation, la partie de l'élément de transmission guidée en translation comprenant au moins des première (17a) et seconde (17b) portions reliées cinématiquement respectivement à des premier (3) et second (4) éléments du dispositif d'affichage, lesdits premier (3) et second (4) éléments étant agencés pour afficher la durée du jour et la durée de la nuit, ledit dispositif d'horlogerie (1) comportant un organe de commande, ledit organe de commande comportant typiquement une couronne de latitude, pour un réglage de la latitude, et **caractérisé en ce que** ledit dispositif de réglage de latitude comprend : une roue (12) ayant un engrenage extérieur et pivotant autour dudit axe (100) ; une bague (13), ayant à la fois une denture intérieure et extérieure et étant coaxiale à la roue (12) ; un tenon (15), parallèle audit axe (100), monté fixe sur la roue (12) et excentré d'une distance d1 par rapport audit axe (100), la distance d1 correspondant à la moitié de la distance d2 séparant ledit axe (100) de la denture intérieure de la bague (13) ; et un pignon (14) de rayon d1, libre de pivoter autour du tenon (15), ledit pignon (14) portant, sur son périmètre extérieur, la goupille de latitude (16) et engrenant avec la denture intérieure de la bague (13) ; le tout agencé de sorte que, lors du réglage de la latitude, il est possible de faire tourner la roue (12) par rapport à la bague (13) pour régler la distance r, r étant comprise entre 0 et d2.

2. Dispositif d'horlogerie (1) selon la revendication 1, **caractérisé en ce que** ladite bague (13) est montée à friction sur la roue (12) de telle sorte qu'elles tournent ensemble sauf lors du réglage de la latitude.

3. Dispositif d'horlogerie (1) selon l'une quelconque des revendications 1 et 2, **caractérisé en ce que** la bague (13) est destinée à être entraînée en rotation de manière continue à une vitesse d'un tour par an et **en ce que** lors du réglage de la latitude, la roue (12) est entraînée en rotation par rapport à la bague (13) par actionnement dudit organe de commande.

4. Dispositif d'horlogerie (1) selon l'une quelconque des revendications 1 et 2, **caractérisé en ce que** la roue (12) est destinée à être entraînée en rotation de manière continue à une vitesse d'un tour par an et **en ce que**, lors du réglage de la latitude, la bague (13) est entraînée en rotation par rapport à la roue (12) par actionnement dudit organe de commande.

5. Dispositif d'horlogerie (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits premier (3) et second (4) éléments sont tous deux en forme d'hélice circulaire, dextres ou senestres, chacun desdits premier (3) et second (4) éléments étant d'une longueur au moins égale à un pas, lesdits éléments (3, 4) étant agencés de telle sorte que la position angulaire d'un élément par rapport à l'autre conduit à la définition de portions

visibles (3a, 4a) de ces éléments (3, 4), la longueur des portions visibles (3a, 4a) desdits premier (3) et second (4) éléments étant respectivement indicative de la durée du jour et de la durée de la nuit.

6. Dispositif d'horlogerie (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdites première (17a) et seconde (17b) portions de l'élément de transmission (17) comprennent respectivement des première et seconde dentures destinées à engrener respectivement avec des premier (19a) et second (19b) trains d'engrenages multiplicateurs, ces trains d'engrenages multiplicateurs (19a, 19b) engrenant respectivement avec une denture dudit premier élément (3) et avec une denture dudit second élément (3).

7. Dispositif d'horlogerie (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits moyens de coopération comprennent une fente (18), la goupille de latitude (16) étant insérée dans ladite fente (18) et pouvant coulisser à l'intérieur.

8. Dispositif d'horlogerie (1) selon la revendication 7, **caractérisé en ce que** ladite fente (18) s'étend dans une direction perpendiculaire à la direction T des mouvements de translation de l'élément de transmission (17).

9. Dispositif d'horlogerie (1) selon l'une quelconque des revendications 6 à 8, **caractérisé en ce que** l'élément de transmission (17) est guidé en translation par lesdits trains d'engrenages multiplicateurs (19a ; 19b).

10. Dispositif d'horlogerie (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que**, pendant le réglage de la latitude, la goupille de latitude (16) se déplace le long d'une ligne droite (d), ladite ligne droite (d) passant par l'axe de rotation (100) de l'élément d'entraînement (11).

11. Pièce d'horlogerie telle qu'une montre de poche ou une montre-bracelet comprenant un mouvement d'horlogerie et un dispositif d'horlogerie (1) selon l'une quelconque des revendications 1 à 10.

12. Pièce d'horlogerie selon la revendication 11, **caractérisée en ce que** ledit dispositif de réglage de latitude peut être actionné depuis l'extérieur de la pièce d'horlogerie.

13. Pièce d'horlogerie selon la revendication 11 ou 12, **caractérisée en ce que** ladite pièce d'horlogerie comporte une graduation de vingt-quatre heures (7) sur ou autour du cadran (30) permettant de lire les heures de lever et de coucher du soleil.

Fig.1

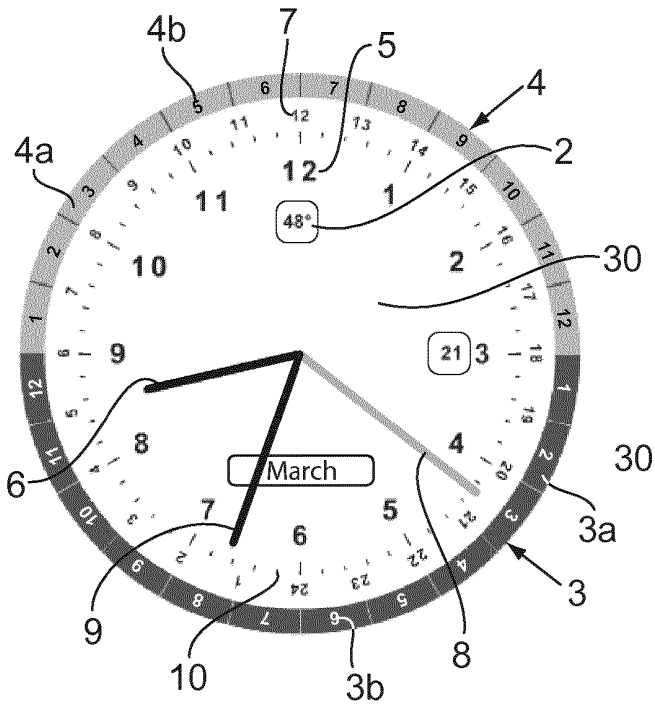

Fig.2

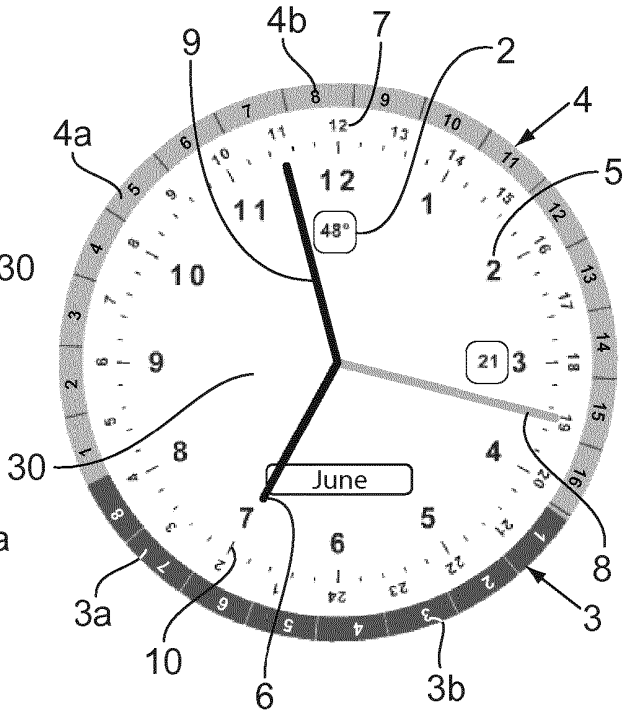

Fig.3

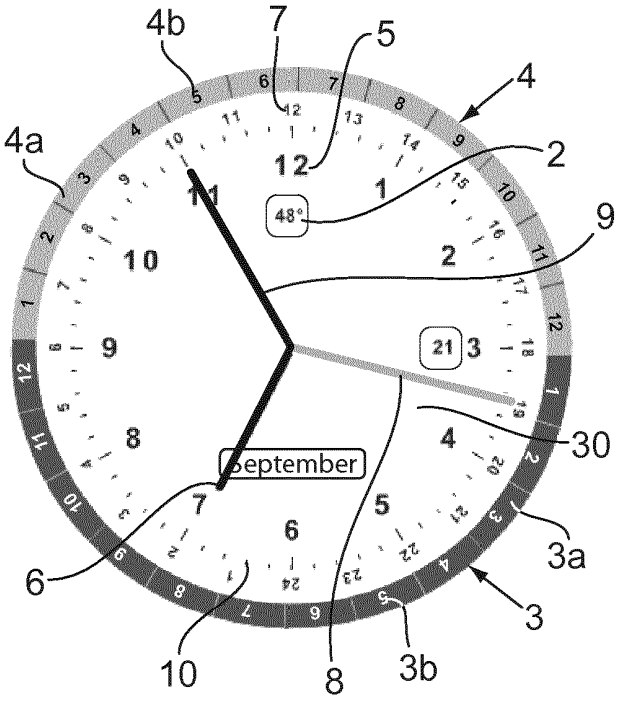

Fig.4

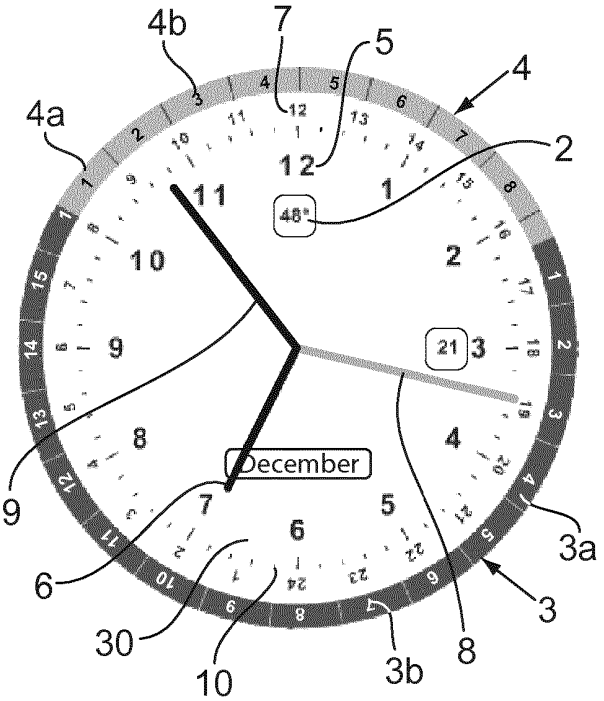

Fig.5

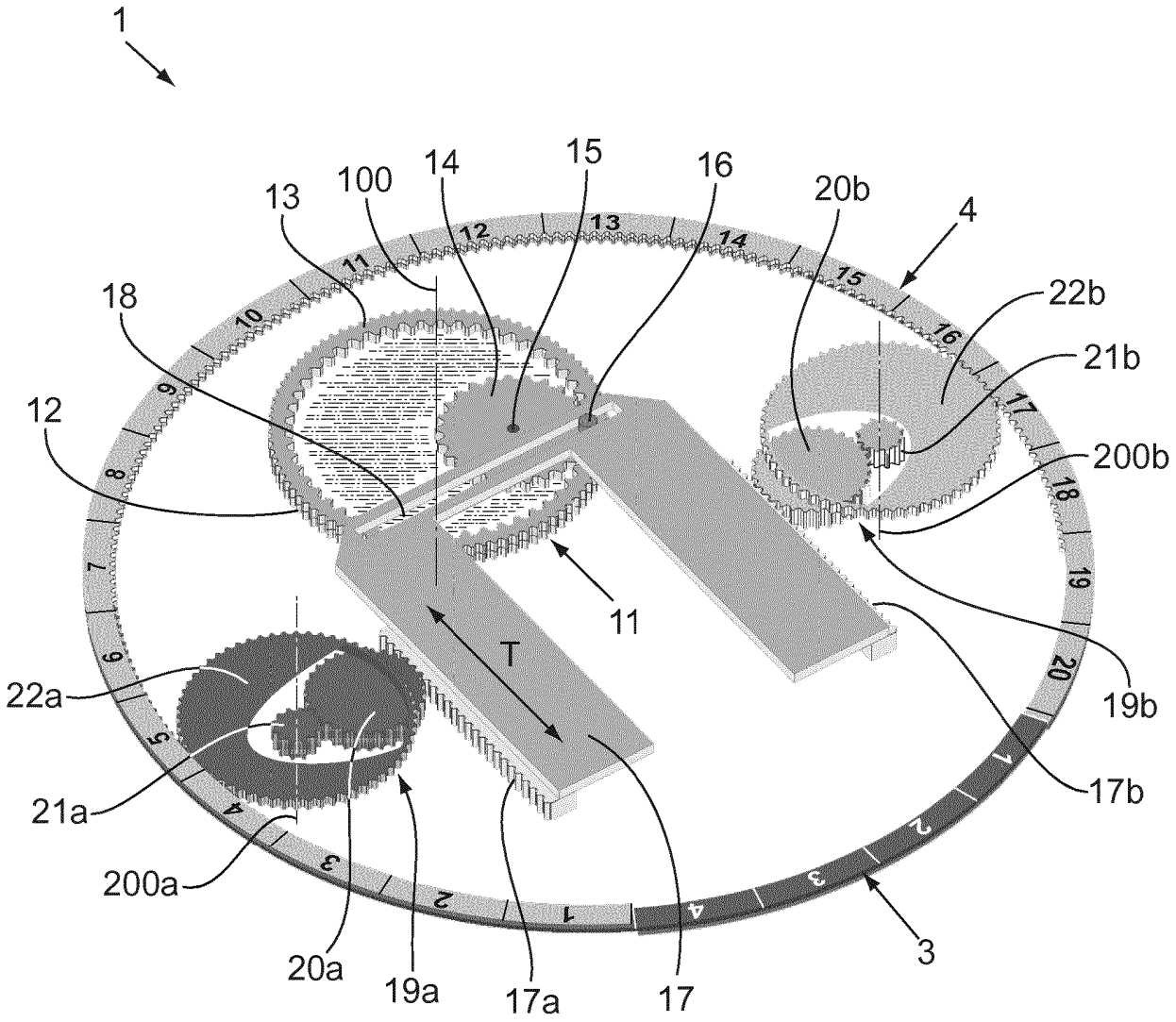
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Fig.6

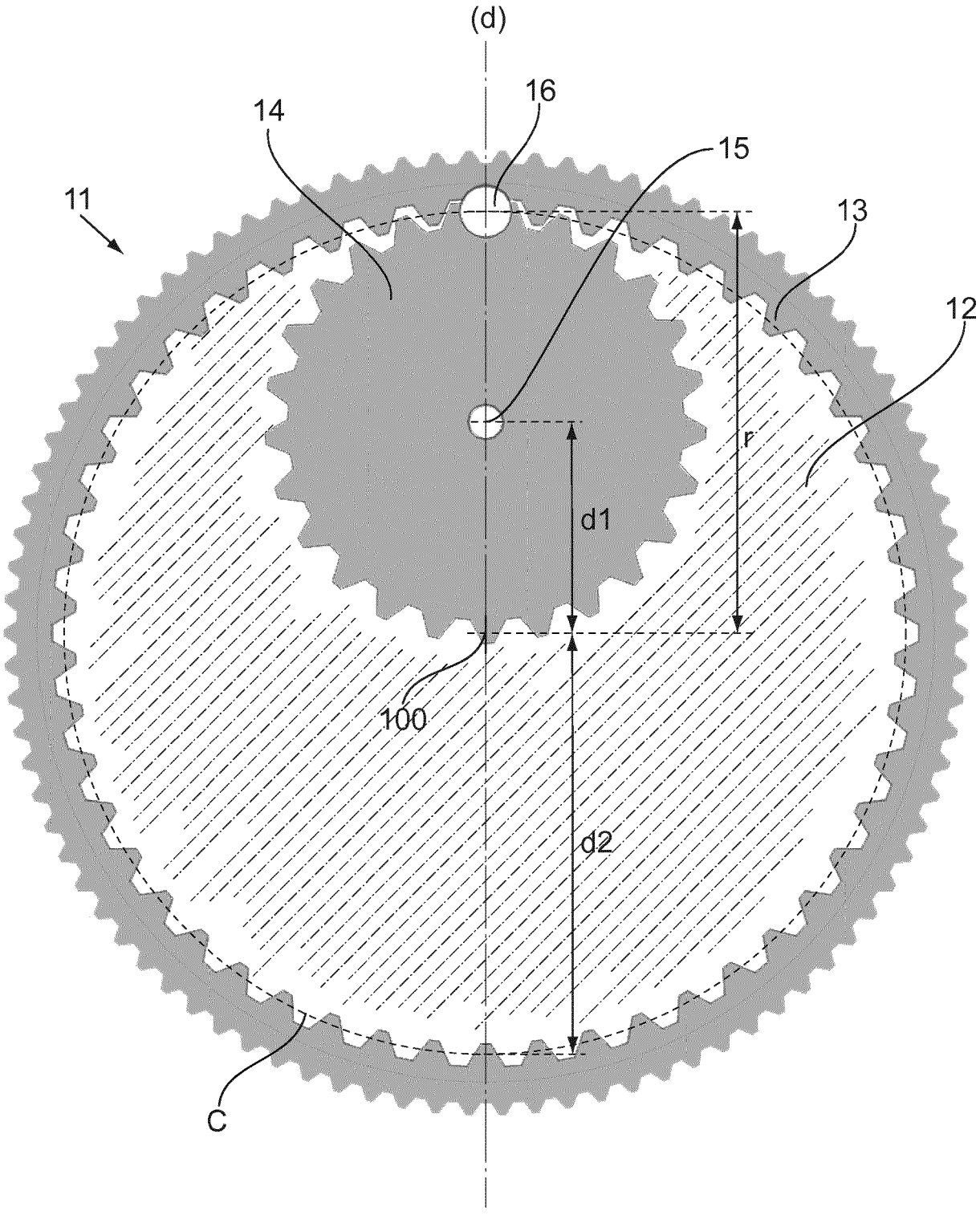

Fig.7a

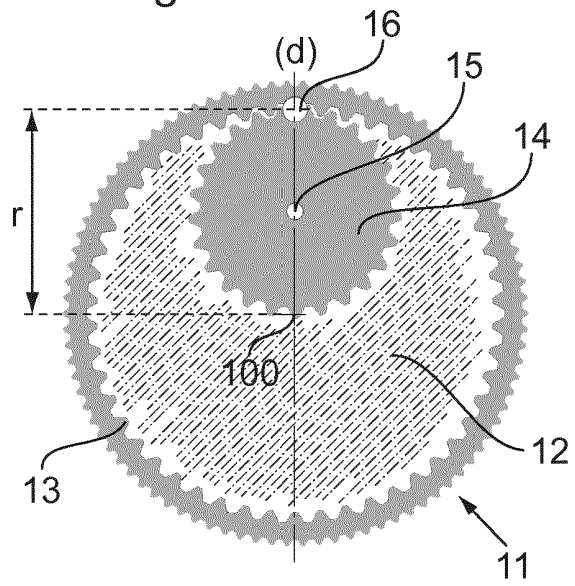

Fig.7b

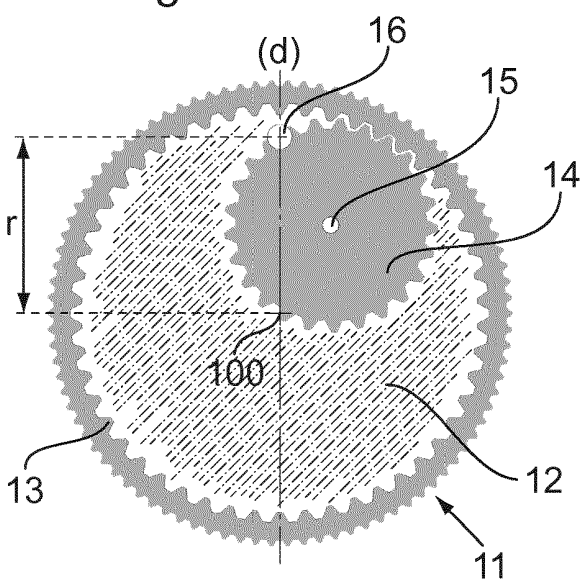

Fig.7c

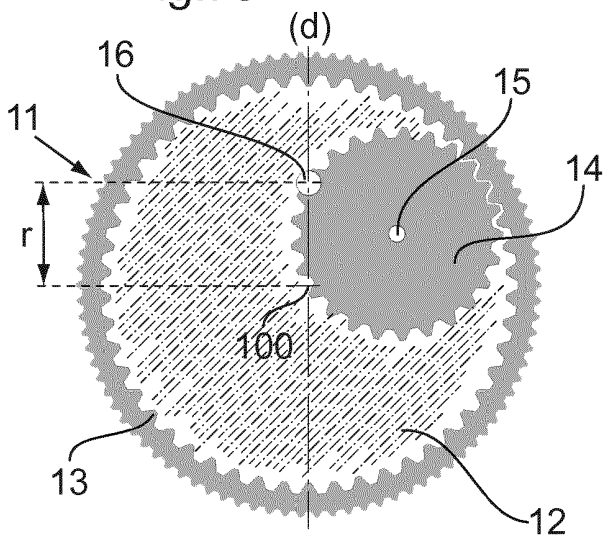

Fig.7d

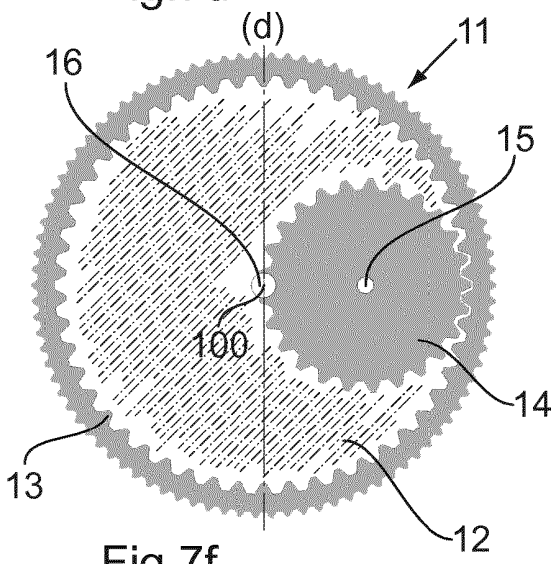

Fig.7e

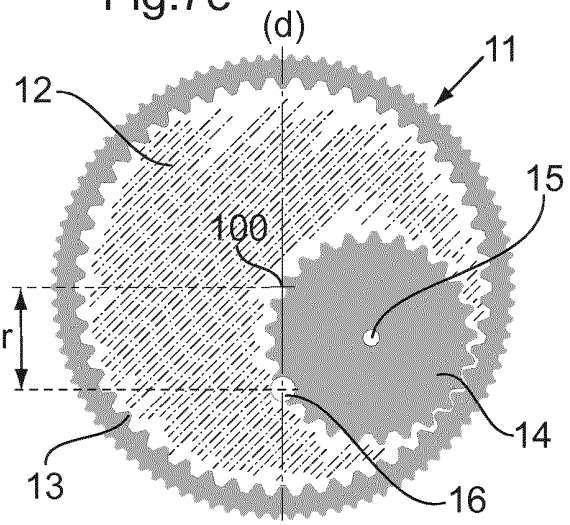

Fig.7f

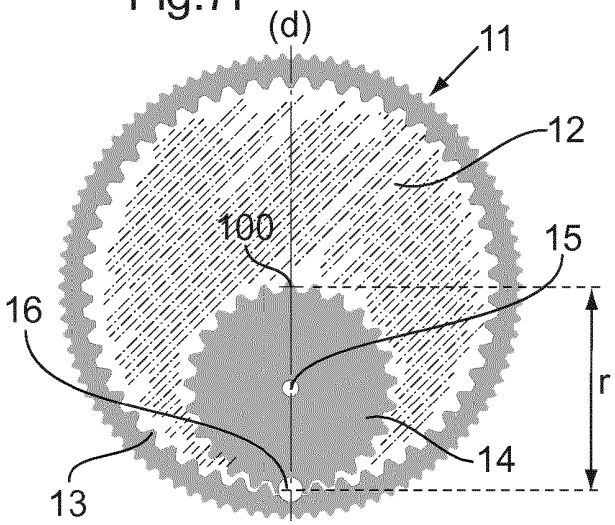

Fig.8a

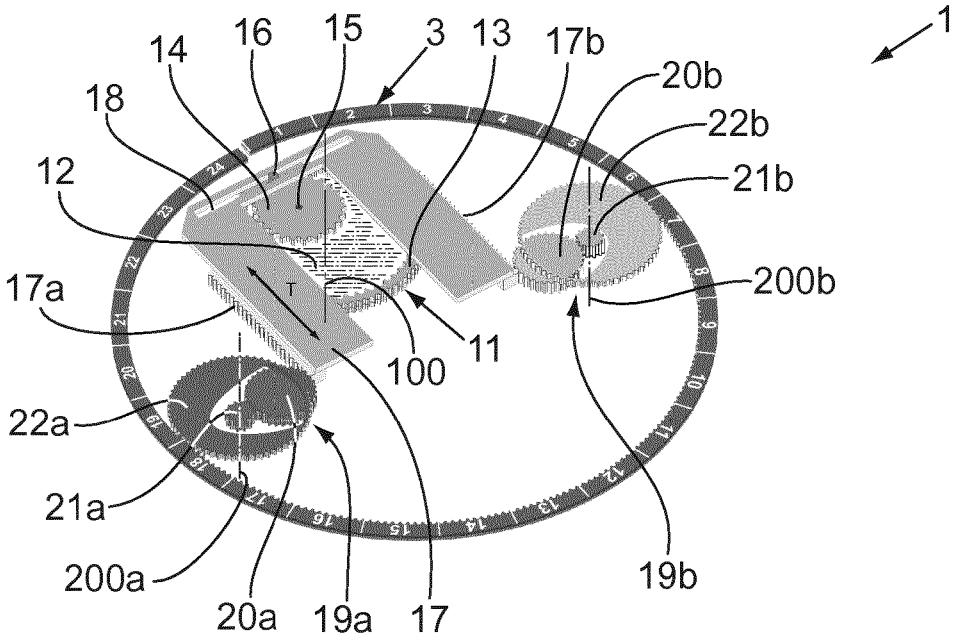
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Fig.8b

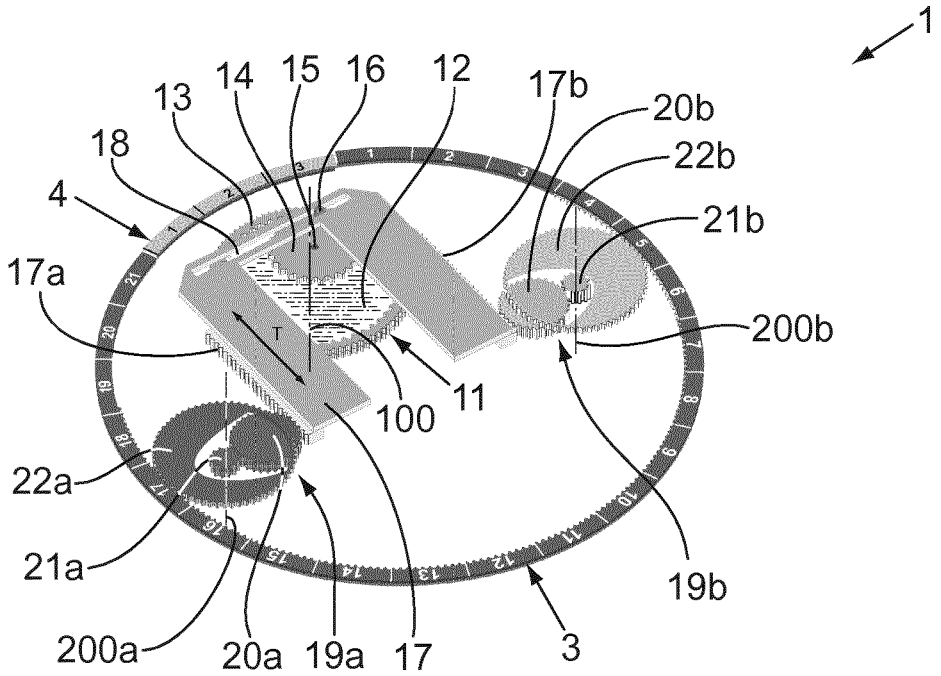
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Fig.8c

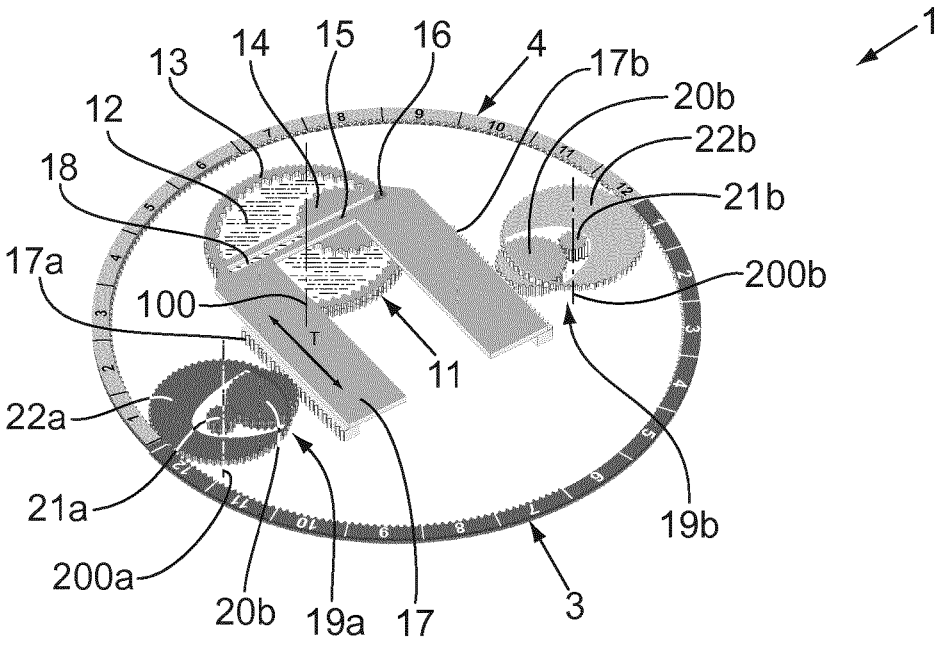
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Fig.8d

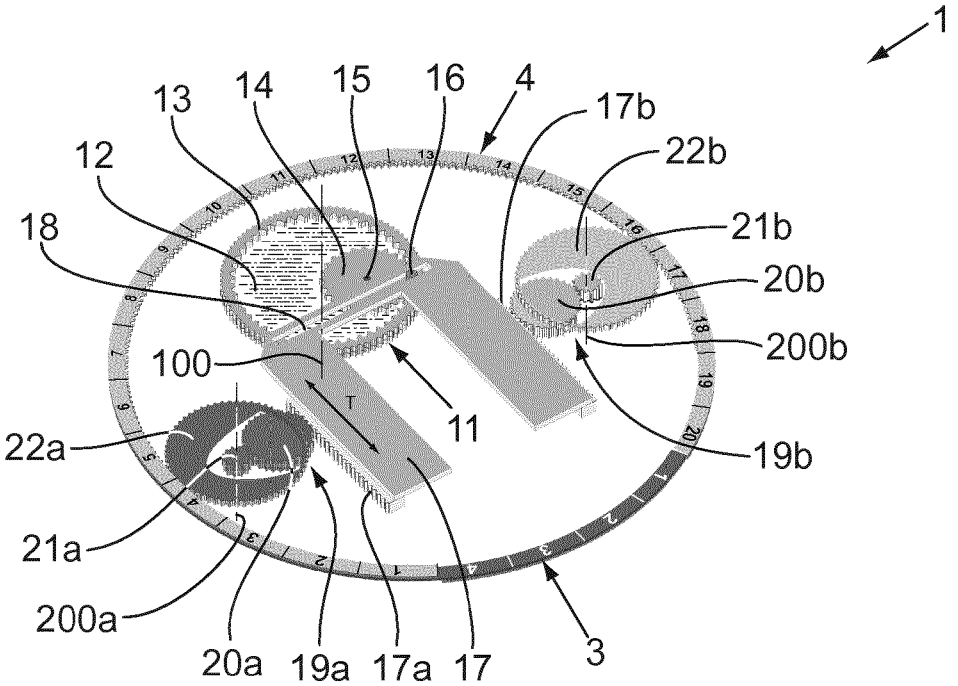
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Fig.8e

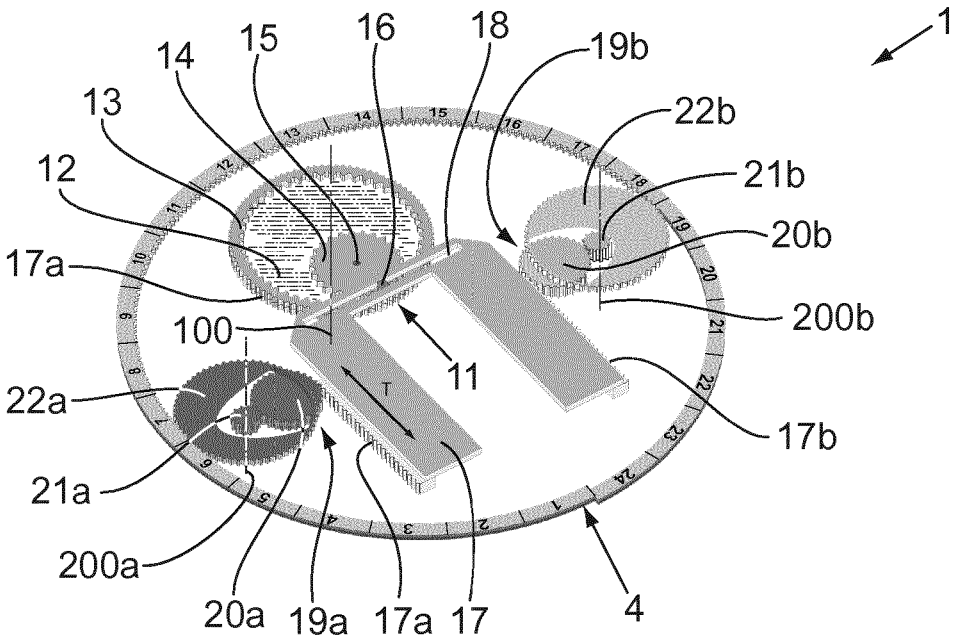
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Fig.8f

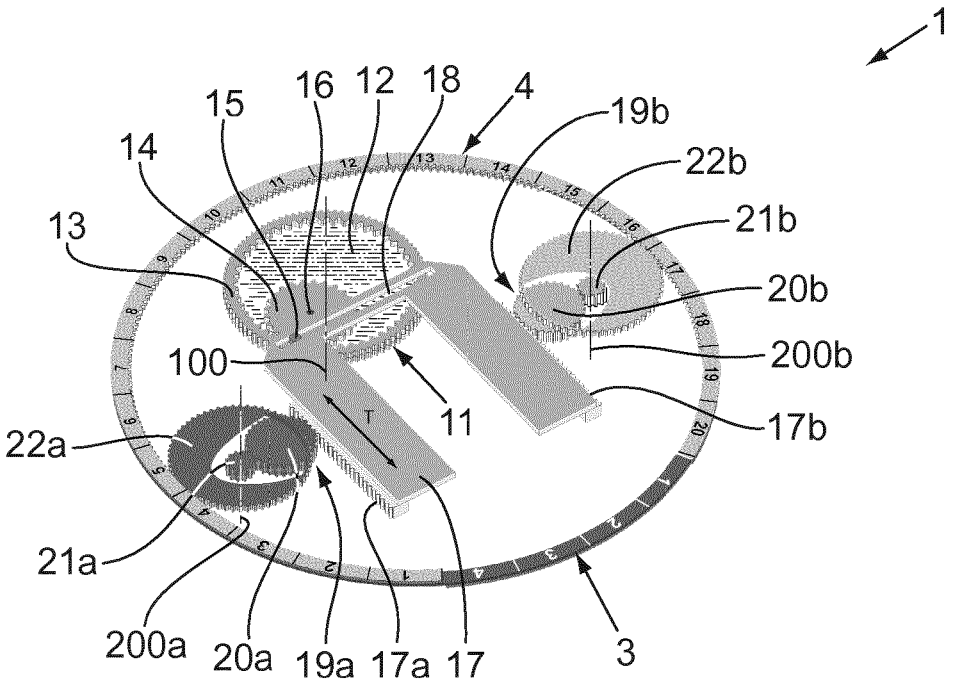
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Fig.8g

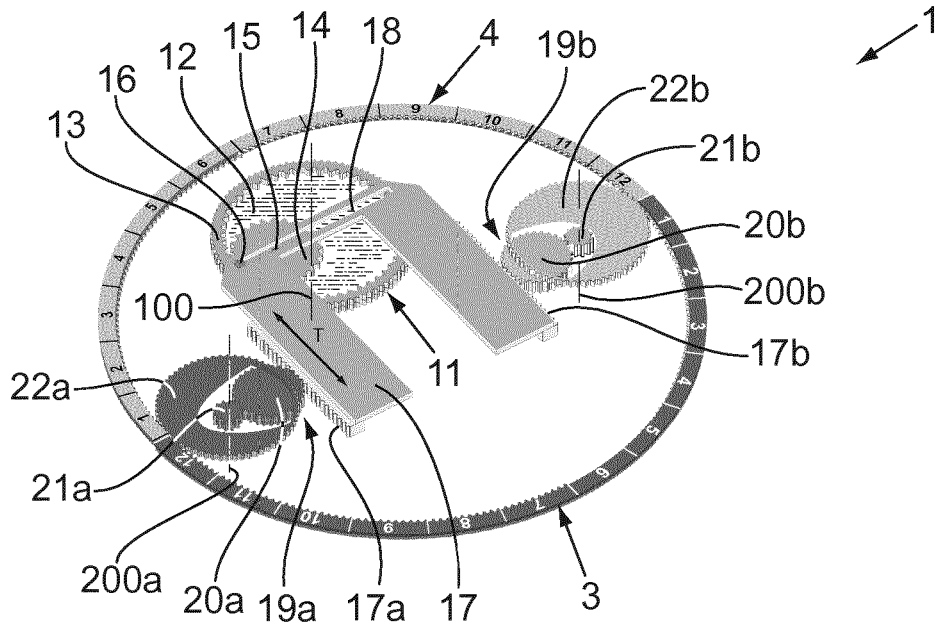
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Fig.8h

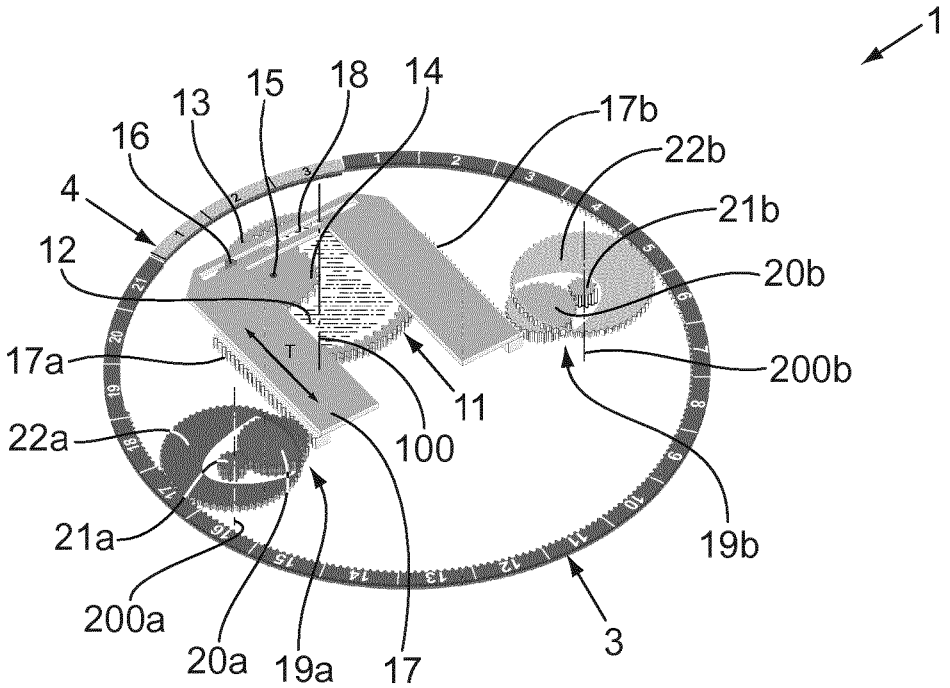
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Fig.9a

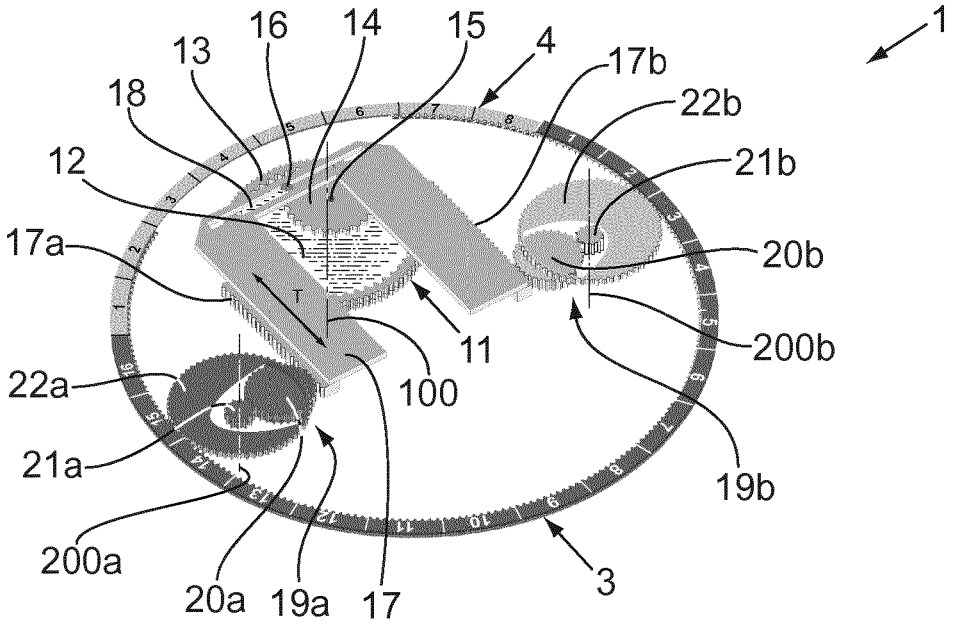
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Fig.9b

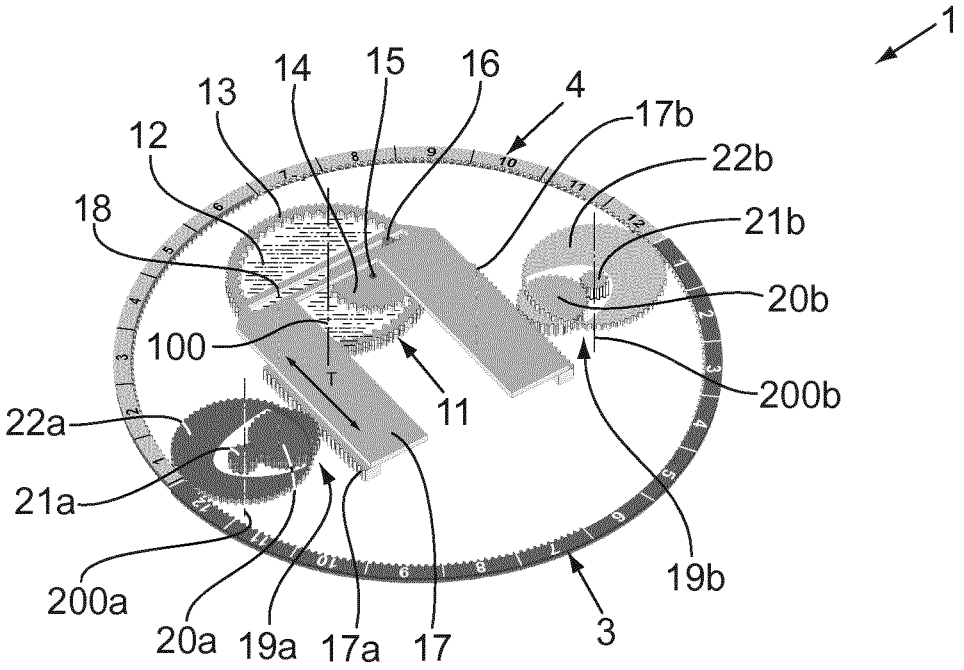
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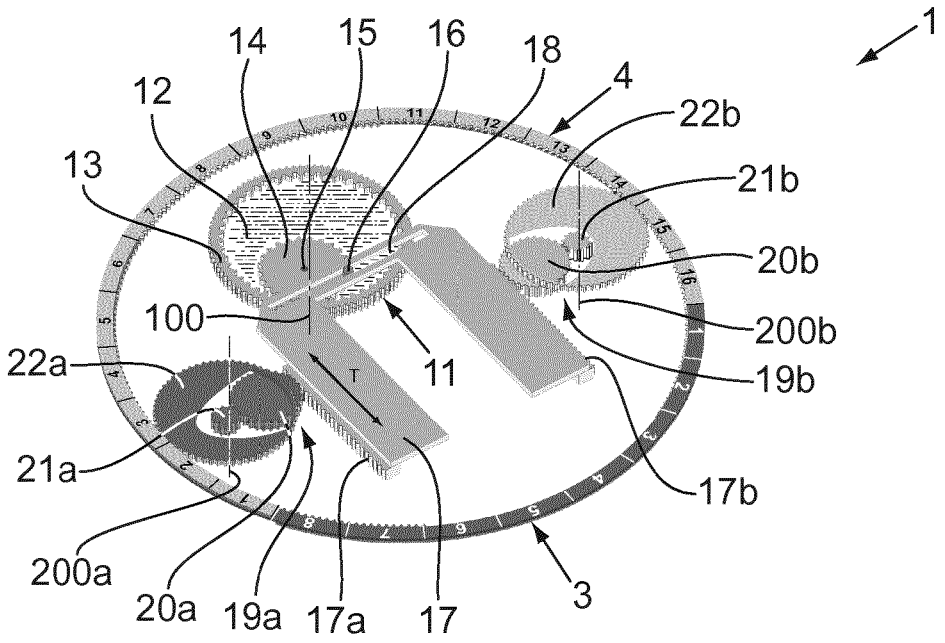
Fig.9c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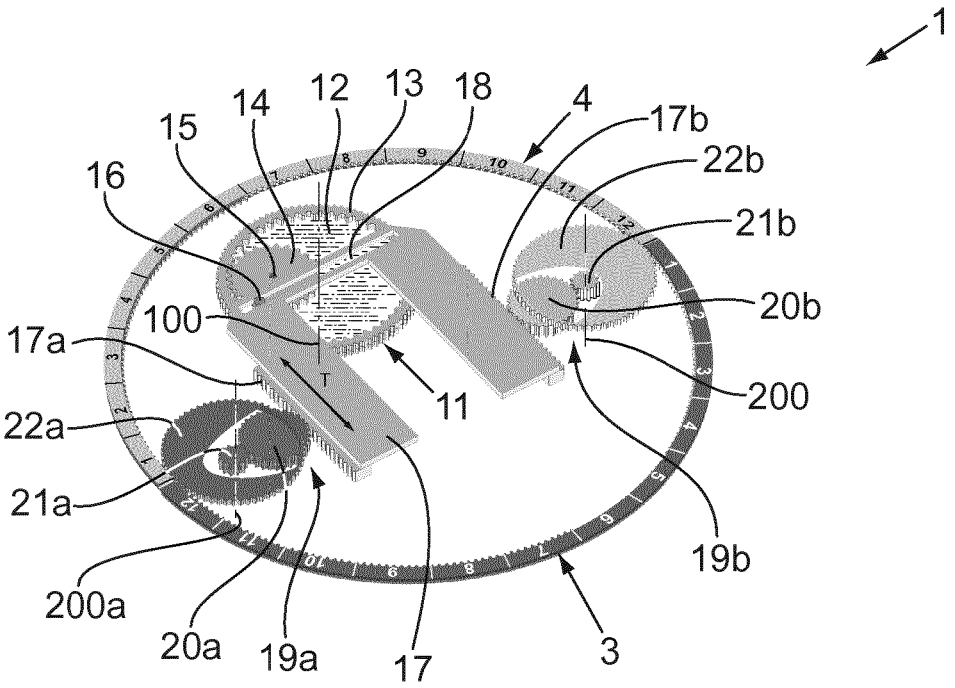
14
15
16
18
12
4
22b
13
21b
20b
100
200b
11
22a
19b
T
21a
17b
200a
20a
19a
17a
17
3

Fig.9d


1
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22a
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19b
200a
20a
19a
17
3

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Patent documents cited in the description

- CH 690516 **[0002]**
- CH 712374 A1 **[0003]**