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(54) **Time counting assembly with a display for world time zones**

(57) A time counting assembly with a display for world time zones comprised of a power source (1), a second counter (2), a minute counter (3), an hour counter (4), and a time zone display (5) for displaying a correct time over a faceplate (53). The user stirs the time zone adjustable ring (52) with the hand to align a first landmark of a local time zone with a fixed point and then calibrates the time counting assembly in accordance with the local time, and then stirs the time zone adjustable ring (52) with the hand to align a second landmark of another locating time zone with the fixed point such that the inner gear ring (522) moves the planetary idle gear set and the planetary base wheel to shift engagement of the engaging hooks (56) in the ratchet holes (523), and the front hour wheel (41) is rotated on the planetary base wheel with a planetary movement along the minute wheel set (32) to cause rotation of a meshed hour wheel (42) so as to turn a hour hand (43) to the time in accordance with the time zone corresponding to the second landmark. The direct time zone adjustment design greatly reduces the thickness of the assembly so that the time counting assembly is usable in a watch or low-profile timer while maintaining world time zone display and adjustable functions, and providing a modularized design function for ultra-thin time recording device.

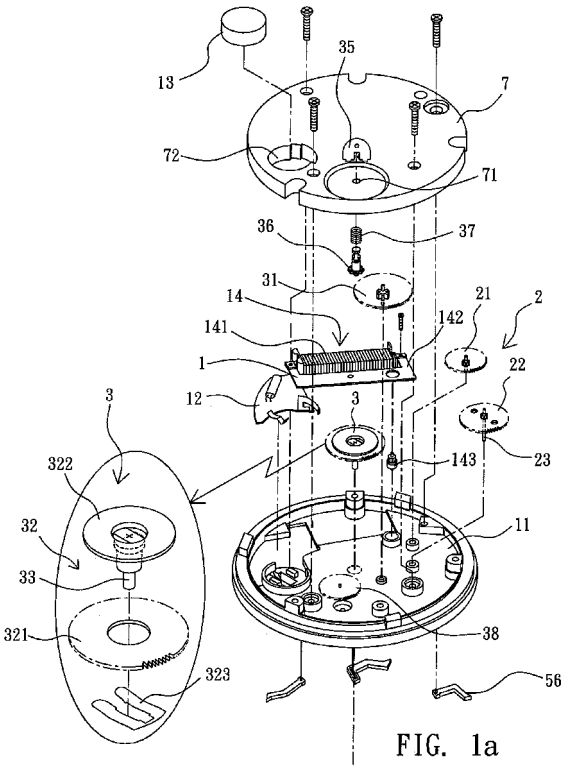

FIG. 1a

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Description

BACKGROUND OF THE INVENTION

Field of The Invention:

[0001] The present invention relates to a time counting assembly, and particularly to a time counting assembly with a display for world time zones.

Description of Related Art:

[0002] It is known that the international exchange is getting more frequent and the transnational contact is getting popular due to the advance of the traffic and communication. In order to consider the factor with regard to the transmission of information and to the time difference, a clock possible to show the time of any other zone, or the so-called world time clock is developed to respond the necessity.

[0003] Mostly, a conventional world time clock at the dial thereof is printed with a world map and a local time is looked up in the world map. The deficiency involved in the conventional world time clock is that the dial appears too much complicated and it does not fulfill the criterion of human engineering from the standpoint of vision cognition and transmission.

[0004] Taking a simple type of world time clock as an example, the movement of this world time clock provides a 24-hour display and the periphery of the dial thereof engages with a time zone ring with 24 typical city names thereon to represent 24 time zones. When the local city name is turned to correspond to the local time in the time zone ring, the time of another related city can be figured out. However, the simple type of world time clock is also involved in a defect that the movement has to provide a 24-hour display. Moreover, the time zone ring is easily loosened after using a period of time caused by no locating device available for the time zone ring being steadily attached to the dial such that it may result in a difficulty of reading the time. Besides, the time zone ring on the simple type of world time clock is disposed to have a distance from the 24-hour graduation on the dial so that it is easy to occur a reading error. Furthermore, the dial has to be arranged with 24 graduations standing for 24 hours and the gap between two neighboring hour graduations is reduced in a limited space such that it is unfavorable for the reading of minute hand and it is not possible for the alarm being aligned accurately.

SUMMARY OF THE INVENTION

[0005] The present invention has been accomplished under the circumstances in view. It is therefore the main object of the present invention to provide a time counting assembly with a display for world time zones, which has a low profile feature with world time zone display and adjustable functions suitable for use in a watch,

[0006] According to one embodiment of the present invention, the time counting assembly with a display for world time zones comprises a power source, a second counter, a minute counter, an hour counter, and a time zone display for displaying a correct time over a faceplate; wherein the time zone display further comprises a time zone adjustable ring rotatably set between a substrate and the faceplate, providing a planetary idle gear set between the substrate and the faceplate to mesh an inner gear ring of the time zone adjustable ring and a planetary base wheel, which is pivoted to a bottom of the substrate, the planetary base wheel allowing a minute wheel set to pass therethrough, the planetary base wheel having a bottom circumferentially pivotally mounted with a front hour wheel of the hour counter, and at least two engaging hooks radially connected to a bottom of the substrate to engage a plurality of ratchet holes that are arranged around the periphery of a top side of the time zone adjustable ring; whereby stir the time zone adjustable ring with the hand to align a first landmark of a local time zone with a fixed point and then calibrate the time counting assembly in accordance with the local time, and then stir the time zone adjustable ring with the hand to align a second landmark of another locating time zone with the fixed point such that the inner gear ring moves the planetary idle gear set and the planetary base wheel to shift engagement of the engaging hooks in the ratchet holes, and the front hour wheel is rotated on the planetary base wheel with a planetary movement along the minute wheel set to cause rotation of a meshed hour wheel so as to turn a hour hand to the time in accordance with the time zone corresponding to the second landmark.

[0007] According to another embodiment of the present invention, the time counting assembly with a display for world time zones comprises a power source, a second counter, a minute counter, an hour counter, and a time zone display for displaying a correct time over a faceplate; wherein the time zone display further comprises a time zone adjustable ring and a retaining ring synchronously rotatably set between a substrate and the faceplate, providing a planetary idle gear set between a substrate and the faceplate to mesh an inner gear ring of the time zone adjustable ring and a planetary base wheel, which is pivoted to a bottom of the substrate, the planetary base wheel allowing a minute wheel set to pass therethrough, the planetary base wheel having a bottom circumferentially pivotally mounted with a front hour wheel of the hour counter, the retaining ring having at least two obliquely inwardly engaging hooks to engage a plurality of ratchet holes on the periphery of a bottom side of the substrate; whereby stir the time zone adjustable ring with the hand to align a first landmark of a local time zone with a fixed point and then calibrate the time counting assembly in accordance with the local time, and then stir the time zone adjustable ring with the hand to align a second landmark of another locating time zone with the fixed point such that the inner gear ring moves the planetary idle gear set and the planetary base wheel

to shift engagement of the engaging hooks in the ratchet holes, and the front hour wheel is rotated on the planetary base wheel with a planetary movement along the minute wheel set to cause rotation of a meshed hour wheel so as to turn a hour hand to the time in accordance with the time zone corresponding to the second landmark.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present invention can be more fully understood by referencing to the following detailed description and accompanying drawings, in which:

Figs. 1 a and 1b are exploded perspective view of a time counting assembly with a display for world time zones according to a first embodiment of the present invention;

Fig. 2 is an exploded view of a part of the first embodiment of the present invention, showing the relationship between the substrate and the related parts;

Fig. 3 is a schematic view after assembled of the parts shown in Fig. 2;

Fig. 4 is a plan view illustrating parts attached to the bottom of the substrate according to the first embodiment of the present invention;

Fig. 5 is an exploded view of a casing and the time counting assembly with a display for world time zones according to the first embodiment of the present invention;

Fig. 6 is a perspective assembly view of Fig. 5;

Figs. 7a and 7b are exploded view of a time counting assembly with a display for world time zones in accordance with a second embodiment of the present invention;

Fig. 8 is an exploded view of a part of the second embodiment of the present invention, showing the relationship between the substrate and the related parts;

Fig. 9 is schematic drawing after assembled of the parts shown in Fig. 7 above the substrate.

Fig. 10 is schematic drawing after assembled of the parts shown in Fig. 7 beneath the substrate;

Fig. 11 is an exploded view of a casing and the time counting assembly with a display for world time zones according to the second embodiment of the present invention; and

Fig. 12 is a perspective assembly view of Fig. 11.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] Referring to Figs. 1 a to 6, a time counting assembly with a display for world time zones according to the present invention basically comprises a power source **1,** a second counter **2,** a minute counter **3,** an hour counter **4,** and a time zone display **5.** In addition, the time counting assembly of the present invention further comprises a day-night display **6.**

[0010] The power source **1** is disposed above a substrate **11** and a circuit board **12,** and the power source **1** provides a battery **13** mounted to the circuit board **12.** Thus, the power can be supplied to a conventional stepping motor **14** composed of a coil **141,** stator **142,** and a rotor **143** so that the rotor **143** can rotate with a constant speed to transmit the power to the second counter **2.**

[0011] The second counter **2** provides a front second wheel **21** is axially attached to the substrate **11** and meshes with the rotor **143** so as to be driven by the rotor **143.** The front second wheel **21** further meshes with a second wheel **22** so that a second spindle **23** under the second wheel **22** can rotate a revolution per minute. The second spindle **23** extends beyond the faceplate **53** to pivotally connect with a second hand/disk **24.**

[0012] The minute counter **3** provides a front minute wheel **31,** which is disposed on the substrate **11,** to mesh with the second wheel **22** and the lower part of front minute wheel **31** passes over the substrate **11** and the circuit board **12** to mesh with a minute wheel set **32** so as to obtain an effect of speed reduction. The minute wheel set **32** at the bottom thereof connects with a minute spindle **33** and the minute spindle **33** extends through the faceplate **53** to fit with a minute hand **34** such that the minute hand **34** can turn 6° per revolution of the second hand/disk **24.**

[0013] Wherein, the minute wheel set **32** provides a minute wheel **321** movably fits with a minute wheel spindle **322** and secured thereto with a retaining strip **323.** An advantage of this arrangement is that, as soon as a time adjusting knob **35** is lifted and turned, a ratchet tooth stem **36** which extends over a cover plate **7** is lifted to compress a spring **37** thereon, causing relative rotation between the ratchet tooth stem **36** and a driven wheel **38** that is pivoted to the surface of the substrate **11,** such that a minute wheel spindle **322,** which meshes with the driven wheel **38** can rotate to move the minute wheel set **32** and the hour counter **4** for obtaining a purpose of time adjustment. The minute wheel **321** turns in a state of idling in spite of being driven by the front minute wheel **31** and the second spindle **23** keeps turning with a constant speed to avoid a possible error resulting from a stop of the second spindle **23** during the time correction.

[0014] The hour counter **4** axially connects with a planetary base gear **51** at the bottom of the substrate **11** and a front hour wheel **41** which is pivoted to the bottom side

of the planetary base gear **51** near one side meshes with the minute wheel spindle **322,** which extends over the substrate **11** and the planetary base gear **51,** such that the front hour wheel **41** can rotate with the planetary base gear **51** to perform a planetary movement. Besides, the front hour wheel **41** at the position of a faceplate **53** meshes with an hour wheel **42** such that the speed of the hour wheel **42** can be reduced to turn 30° per 60 minutes. Hence, the hour wheel **42** passes through the faceplate **53** and connects with an hour hand **43.**

[0015] The planetary base gear **51** of the time zone display **5** is coupled to the bottom of the substrate **11** at the center with its center hole for the passing of the minute wheel spindle **322** and meshes the front hour wheel **41.** A time zone adjustable ring **52** is set between the substrate **11** and the faceplate **53.** The time zone adjustable ring **52** has a plurality of connecting portions **521,** for example projections, to connect with a landmark ring **81** (see FIG. 6), which has carried thereon typical city names corresponding to 24 time zones. The time zone adjustable ring **52** provides an inner gear ring **522** to mesh with a planetary idle gear **54,** which axially connects with the faceplate **53** at a circumferential opening thereof. Besides, the planetary base gear **51** meshes a planetary driven gear **55,** which has a plurality of bottom insertion holes **551** respectively coupled to respective pins **541** of the planetary idle gear **54** such that a planetary idle gear set can be constituted accordingly.

[0016] Moreover, at least two engaging hooks **56** are radially peripherally provided at the bottom of the substrate **11** to engage a plurality of ratchet holes **523,** which are equiangularly arranged above the inner gear ring **522.** Thus, as soon as the time zone adjustable ring **52** is turned to one of the time zones and the planetary idle gear **54** rotates with the planetary driven gear **55,** the planetary base gear **51** can be driven by the planetary driven gear **55** to rotate the front hour wheel **41** with a planetary movement. Next, the hour wheel **42** can be turned along with the hour hand **43** on the faceplate **53** synchronously. In fact, while the planetary base gear **51** is in a state of planetary movement, the front hour wheel **41** rotates about the minute wheel spindle **322** without interfering the movement of the planetary base gear **51** so that it is not possible to generate an error of time reading.

[0017] Besides, the ratchet holes **523** are unidirectional and its number is 24 corresponding to the 24 typical city names of the 24 time zones on the landmark ring **81** so that the time zone adjustable ring **52** can only turn in a reverse direction during being stirred with hand. In the mean time, the at least two engaging hooks **56** can selectively engage with the ratchet holes **523** to perform a sharp pause at an exact hour location.

[0018] Referring to Figs. 1 b and 6 again, the present invention further comprises a day-night display **6,** which is possible for being known the state of daytime or the state of nighttime if it is necessary. The day-night display **6** provides a day-night gear **61,** which is pivoted to the substrate **11** and meshed with the hour wheel **42.** The day-night gear **61** is received in a hole **531** on the faceplate **53** for rotation with the hour wheel **42.** The day-night gear **61** carries a decoration mark **62** (see FIG. 6) as a day-night symbol to indicate the state of daytime or the state of nighttime. Due to engaging with the hour wheel **42** constantly, the day-night gear **61** runs along with the hour wheel **42** so that the situations of day and night with regard to the local time of the user can be shown under a normal state. When the user stirs the time zone adjustable ring **52** with hand, the hour wheel **42** may generate an opposite turning and the day-night gear **61** further turns along with the hour wheel **42.** As soon as the day-night gear **61** is adjusted to a desired time zone, the decoration mark **62** represents the situation of day-night of the local time. Hence, the 12-hour movement disclosed in the present invention can distinguish the state of daytime from the state of nighttime and display the time corresponding to the respective state.

[0019] The cover **7** is provided to be attached to the substrate **11** and at the outer surface thereof has a stem hole **71** and a battery hole **72** for receiving the ratchet tooth stem **36** and a battery **13** respectively. The battery hole **72** can be closed with a battery cover. Alternatively, the time counting assembly can be mounted in a casing **8** and covered with a back cover **84** on the back side of the casing **8** to prohibit escape of the battery **13.**

[0020] Figs. 7a~12 show a time counting assembly in accordance with a second embodiment of the present invention. This second embodiment alters the structure of the ratchet holes and inner gear ring of the time zone adjusting ring and the at least two engaging hooks. The time counting assembly with a display for world time zones according to this second embodiment basically comprises a power source **1,** a second counter **2,** a minute counter **3,** an hour counter **4,** and a time zone display **5.** In addition, the time counting assembly of this second embodiment further comprises a day-night display **6.** The power source **1,** the second counter **2,** the minute counter **3,** and the day-night display **6** are substantially similar to the like parts in the aforesaid first embodiment, therefore no further description of the joining relationship among related parts is necessary.

[0021] The difference between the hour counter **4** of this second embodiment and the hour counter of the aforesaid first embodiment is that the front hour wheel **41** is circumferentially pivoted to the bottom of the planetary base gear **51** with a pivot shaft **411.**

[0022] The planetary base gear **51** of the time zone display **5** is axially coupled to the bottom of the substrate **11** with its center hole for the passing of the minute wheel spindle **322,** and meshed with the front hour wheel **41** at the bottom of the substrate **11.** The time zone adjustable ring **52** is set with a retaining ring **57** between the substrate **11** and the faceplate **53.** The time zone adjustable ring **52** has a plurality of connecting portions **521,** for example projections, to connect with a landmark ring **81** (see FIG. 12). The time zone adjustable ring **52** provides

an inner gear ring **522** to mesh with a planetary idle gear **54,** which axially connects with the faceplate **53** at a circumferential opening thereof. Besides, the planetary base gear **51** meshes a planetary driven gear **55,** which has a plurality of bottom insertion holes **551** respectively coupled to respective pins **541** of the planetary idle gear **54** such that a planetary idle gear set can be constituted accordingly.

[0023] Moreover, a plurality of ratchet holes **15** are arranged on the bottom of the substrate **11** around its periphery, and the retaining ring **57** has a plurality of pins **571** respectively engaged into respective pin holes **524** on the time zone adjustable ring **52** such that the retaining ring **57** can be rotated with the time zone adjustable ring **52** synchronously. The retaining ring **57** has obliquely inwardly extending from the periphery thereof at least two engaging hooks **572** to engage the ratchet holes **15.** Thus, as soon as the time zone adjustable ring **52** is turned to one of the time zones and the planetary idle gear **54** rotates with the planetary driven gear **55,** the planetary base gear **51** can be driven by the planetary driven gear 55 to rotate the front hour wheel **41** with a planetary movement. Next, the hour wheel **42** can be turned along with the hour hand **43** on the faceplate **53** synchronously. In fact, while the planetary base gear **51** is in a state of planetary movement, the front hour wheel **41** rotates about the minute wheel spindle **322** without interfering the movement of the planetary base gear **51** so that it is not possible to generate an error of time reading.

[0024] Besides, the ratchet holes **15** are unidirectional and its number is 24 corresponding to the 24 typical city names of the 24 time zones on the landmark ring **81** so that the time zone adjustable ring **52** can only turn in a reverse direction during being stirred with hand. In the mean time, the at least two engaging hooks **572** of the retaining ring **57** can selectively engage with the ratchet holes **15** to perform a sharp pause at an exact hour location.

[0025] The cover 7 is provided to be attached to the substrate **11** and at the outer surface thereof has a stem hole **71** and a battery hole **72** for receiving the ratchet tooth stem **36** and a battery **13** respectively. The battery hole **72** can be closed with a battery cover **73.**

[0026] Referring to Figs. 5 and 11, the time counting assembly according to either the first embodiment or the second embodiment can be mounted in a casing **8,** for example, a watch casing. The landmark ring **81** is secured to the front side of the casing **8,** having 24 typical city names of the 24 time zones marked thereon. The landmark ring **81** has a plurality of connecting portions **811,** for example, recesses corresponding to the connecting portions **521** of the time zone adjustable ring **52** such that stir the landmark ring **81** moves the time zone adjustable ring **52** for viewing of the times in other time zones. Further, the landmark ring **81** is covered with a lens **82.** To provide a waterproof function, a gasket ring **83** is respectively provided between the lens **82** and the landmark ring **81** and between the landmark ring **81** and the casing **8.** Further, a back cover **84** is covered on the back side of the casing **8.** By means of stirring the peripheral embossment **841** or center finger groove **842** to rotate the back cover **84,** the back cover **84** is fastened to or disconnected from the casing **8,** facilitating time correction or battery **13** replacement. Further, to facilitate turning of the landmark ring **81,** grooves **812** are provided around the periphery of the landmark ring **81** for the positive contact of the hand. Further, an ornamental plate **58** is fastened to the front side of the faceplate **53** for decoration. The ornamental plate **58** has time graduations, i.e., graduations for hours, minutes and seconds, and a semicircular window for viewing of the state of daytime and the state of nighttime. These are of the known art, no further detailed description is necessary.

[0027] Referring to Figs. 6 to 12, while the time counting assembly with a display for world time zones of the present invention is in use, the user aligns the local landmark, for example, H.K./Taipei with a fixed point such as the 12 o'clock first and then the time adjusting knob **35** is turned to calibrate the minute counter **3** and the hour counter **4** in accordance with the local time. Next, the time shown on the day-night display **6** can be read by way of the decoration mark **62** thereof such as the time being adjusted to 12 o'clock at noon. In order to look into another time zone such as the time in Chicago, it is only necessary to stir the landmark ring **81** to move the time zone adjustable ring **52** and the hour counter **4** synchronously and the landmark of Chicago is aligned with the direction of 12 o'clock such that the day-night gear **61** shows a decoration mark **62** representing the night at the present time with the hour hand **43** indicating 10 o'clock and it means the present time in Chicago is 10 o'clock at night, which is not appropriate to make a business phone call.

[0028] If local daylight saving time is held from March through October, as shown in Fig. 12, a D.S.T. position mark is marked on the ornamental plate **58.** While adjusting the time subject to the local daylight saving time, rotate the landmark ring **81** counter-clockwise to move the time zone adjustable ring **52** synchronously to have the landmark of the set city be aligned with the D.S.T. position mark, eliminating a complicated hour hand adjustment procedure.

[0029] It is appreciated that the advantages of the present invention can be summarized hereinafter:

(1) It provides a low profile feature. When compared to Taiwan Patent 90117521 (equivalent to US 6,636,457 and China 01120668.3), the time counting assembly of the present invention reduces the number of parts to reduce the thickness of the whole assembly so that the time counting assembly is usable in a watch or low-profile timer while maintaining world time zone display and adjustable functions, and providing a modularized design function for ultra-thin time recording device.

(2) It is easy for the user to read the time. Because the present invention adopts a 12-hour movement to display the time so that the local time and other time zones can be easily read without changing the accustomed way for reading the time.

(3) It is easily operated and offers accurate time information. In case of other time zones being checked, it is only necessary to stir the time zone adjustable ring such that the hour counter can perform a planetary movement on the planetary basic gear and it is possible for the hour counter to move along with exact hour graduation for the specific time at both places respectively or for the time difference between both places being distinguishable easily and conveniently.

(4) It provides a function of day-night reading. The difference between decoration marks shown on the day-night display disk is possible for the user to differentiate the state of daytime or nighttime for a certain time zone easily.

[0030] While the invention has been described with reference to a preferred embodiment thereof, it is to be understood that modifications or variations may be easily made without departing from the spirit of this invention, which is defined by the appended claims.

Claims

1. A time counting assembly with a display for world time zones, comprising a power source (1), a second counter (2), a minute counter (3), an hour counter (4), and a time zone display (5) for displaying a correct time over a faceplate (53); wherein the time zone display (5) further comprises
a time zone adjustable ring (52) rotatably set between a substrate (11) and the faceplate (53), providing a planetary idle gear set between the substrate (11) and the faceplate (53) to mesh an inner gear ring (522) of said time zone adjustable ring (52) and a planetary base wheel, which is pivoted to a bottom of said substrate (11), said planetary base wheel allowing a minute wheel set (32) to pass therethrough, said planetary base wheel having a bottom circumferentially pivotally mounted with a front hour wheel (41) of said hour counter (4), and at least two engaging hooks (56) radially connected to a bottom of said substrate (11) to engage a plurality of ratchet holes (523) that are arranged on the periphery of a top side of said time zone adjustable ring (52);
whereby stir said time zone adjustable ring (52) with the hand to align a first landmark of a local time zone with a fixed point and then calibrate the time counting assembly in accordance with the local time, and then stir said time zone adjustable ring (52) with the hand to align a second landmark of another locating time zone with said fixed point such that said inner gear ring (522) moves said planetary idle gear set and said planetary base wheel to shift engagement of said engaging hooks (56) in said ratchet holes (523), and said front hour wheel (41) is rotated on said planetary base wheel with a planetary movement along said minute wheel set (32) to cause rotation of a meshed hour wheel (42) so as to turn a hour hand (43) to the time in accordance with the time zone corresponding to said second landmark.

2. The time counting assembly with a display for world time zones according to claim 1, wherein
said power source (1) is disposed above said substrate (11) and a circuit board (12) providing a stepping motor (14) with a rotor (143) rotating with a constant speed and a power thereof being supplied by a battery (13);
said second counter (2) provides a front second wheel (21) meshing with said rotor (143) and a second wheel (22) respectively, said second wheel (22) extending downward a second spindle (23) to connect a second hand/disk (24) on said faceplate (53);
said minute counter (3) provides said front minute wheel (31) meshing with said second wheel (22) and a lower part thereof further meshing with a minute wheel set (32), said minute wheel set (32) having a minute spindle (33) extending from a bottom thereof over said faceplate (53) and connecting with a minute hand (34); and
said hour counter (4) provides said front hour wheel (41) to mesh with said minute wheel set (32) and an hour wheel (42) respectively, said hour wheel (42) being passed through by a minute spindle (33), which extends over said faceplate (53) to connect with an hour hand (43).

3. The time counting assembly with a display for world time zones according to claim 1, wherein said minute wheel set (32) provides a minute wheel (321) to movably fit with a minute wheel spindle (322), which is secured to said minute wheel (321) with a retaining strip (323), said minute wheel spindle (322) being disposed on the center of said substrate (11) and passing through said planetary base wheel so as to mesh with said front hour wheel (41); and when calibrating the time, said minute wheel (321) is driven by said front minute wheel (31) to run idle.

4. The time counting assembly with a display for world time zones according to claim 1, wherein said ratchet holes (523) are unidirectional, and the number of said ratchet holes (523) is 24 corresponding to the 24 time zones.

5. The time counting assembly with a display for world time zones according to claim 1, further comprising

a day-night display (6), said day-night display (6) providing a day-night gear (61) received in a hole (531) on said faceplate (53) and meshing with said hour wheel (42) for rotation with said hour wheel (42), said day-night gear (61) carrying a decoration mark (62) as a day-night symbol to indicate the state of daytime/the state of nighttime.

6. The time counting assembly with a display for world time zones according to claim 1, wherein said planetary idle gear set provides a planetary idle gear (54) pivotally disposed above said faceplate (53), and a planetary driven gear (55) pivoted to said substrate (11)

7. The time counting assembly with a display for world time zones according to claim 6, wherein at least two pins (541) and at least two pin holes (524) are coupled between said planetary idle gear (54) and said planetary driven gear (55) to cause synchronous rotation between said planetary idle gear (54) and said planetary driven gear (55).

8. The time counting assembly with a display for world time zones according to claim 1, further comprises a time calibration means, said time calibration means comprising a ratchet tooth stem (36) meshing with a driven wheel (38) that is pivoted to said substrate (11) and meshes said minute wheel spindle (322), a time calibration knob for lifting and rotating said ratchet tooth stem (36), and spring (37) mounted on said ratchet tooth stem (36) and compressible by said ratchet tooth stem (36) upon lifting of said ratchet tooth stem (36) by said time calibration knob,

9. The time counting assembly with a display for world time zones according to claim 1, further comprising a cover fastened to a back side of said substrate (11), said cover having a stem hole (71) and a battery hole (72) for receiving a part of a time calibration means and a battery (13) respectively.

10. The time counting assembly with a display for world time zones according to claim 1, wherein the time counting assembly is mounted in a casing (8), said casing (8) having a landmark ring (81) at a front side thereof, said landmark ring (81) carrying thereon typical city names corresponding to the 24 time zones, said landmark ring (81) having a plurality of connecting portions (811) to connect said time zone adjustable ring (52), a lens (82) on a front side of said landmark ring (81), a back cover (84) on a back side of said casing (8), said landmark ring (81) moving said time zone adjustable ring (52) and said hour counter (4) for viewing the time in another one of the 24 time zones when rotated.

11. A time counting assembly with a display for world time zones, comprising a power source (1), a second counter (2), a minute counter (3), an hour counter (4), and a time zone display (5) for displaying a correct time over a faceplate (53); wherein the time zone display (5) further comprises

a time zone adjustable ring (52) and a retaining ring (57) synchronously rotatably set between a substrate (11) and the faceplate (53), providing a planetary idle gear set between a substrate (11) and said faceplate (53) to mesh an inner gear ring (522) of said time zone adjustable ring (52) and a planetary base wheel, which is pivoted to a bottom of said substrate (11), said planetary base wheel allowing a minute wheel set (32) to pass therethrough, said planetary base wheel having a bottom circumferentially pivotally mounted with a front hour wheel (41) of said hour counter (4), said retaining ring (57) having at least two obliquely inwardly engaging hooks (572) to engage a plurality of ratchet holes (15) on the periphery of a bottom side of said substrate (11); whereby stir said time zone adjustable ring (52) with the hand to align a first landmark of a local time zone with a fixed point and then calibrate the time counting assembly in accordance with the local time, and then stir said time zone adjustable ring (52) with the hand to align a second landmark of another locating time zone with said fixed point such that said inner gear ring (522) moves said planetary idle gear set and said planetary base wheel to shift engagement of said engaging hooks (572) in said ratchet holes (15), and said front hour wheel (41) is rotated on said planetary base wheel with a planetary movement along said minute wheel set (32) to cause rotation of a meshed hour wheel (42) so as to turn a hour hand (43) to the time in accordance with the time zone corresponding to said second landmark.

12. The time counting assembly with a display for world time zones according to claim 11, wherein

said power source (1) is disposed above said substrate (11) and a circuit board (12) providing a stepping motor (14) with a rotor (143) rotating with a constant speed and a power thereof being supplied by a battery (13);

said second counter (2) provides a front second wheel (21) meshing with said rotor (143) and a second wheel (22) respectively, said second wheel (22) extending downward a second spindle (23) to connect a second hand/disk (24) on said faceplate (53);

said minute counter (3) provides said front minute wheel (31) meshing with said second wheel (22) and a lower part thereof further meshing with a minute wheel set (32), said minute wheel set (32) having a minute spindle (33) extending from a bottom thereof over said faceplate (53) and connecting with a minute hand (34); and

said hour counter (4) provides said front hour wheel (41) to mesh with said minute wheel set (32) and an

hour wheel (42) respectively, said hour wheel (42) being passed through by a minute spindle (33), which extends over said faceplate (53) to connect with an hour hand (43).

13. The time counting assembly with a display for world time zones according to claim 11, wherein said minute wheel set (32) provides a minute wheel (321) to movably fit with a minute wheel spindle (322), which is secured to said minute wheel (321) with a retaining strip (323), said minute wheel spindle (322) being disposed on the center of said substrate (11) and passing through said planetary base wheel so as to mesh with said front hour wheel (41); and when calibrating the time, said minute wheel (321) is driven by said front minute wheel (31) to run idle.

14. The time counting assembly with a display for world time zones according to claim 11, wherein said ratchet holes (15) are unidirectional, and the number of said ratchet holes (15) is 24 corresponding to the 24 time zones.

15. The time counting assembly with a display for world time zones according to claim 11, further comprising a day-night display (6), said day-night display (6) providing a day-night gear (61) received in a hole (531) on said faceplate (53) and meshing with said hour wheel (42) for rotation with said hour wheel (42), said day-night gear (61) carrying a decoration mark (62) as a day-night symbol to indicate the state of daytime/the state of nighttime.

16. The time counting assembly with a display for world time zones according to claim 11, wherein said planetary idle gear set provides a planetary idle gear (54) pivotally disposed above said faceplate (53), and a planetary driven gear (55) pivoted to said substrate (11).

17. The time counting assembly with a display for world time zones according to claim 16, wherein at least two pins (571) and at least two pin holes (524) are coupled between said planetary idle gear (54) and said planetary driven gear (55) to cause synchronous rotation between said planetary idle gear (54) and said planetary driven gear (55).

18. The time counting assembly with a display for world time zones according to claim 11, further comprises a time calibration means, said time calibration means comprising a ratchet tooth stem (36) meshing with a driven wheel (38) that is pivoted to said substrate (11) and meshes said minute wheel spindle (322), a time calibration knob for lifting and rotating said ratchet tooth stem (36), and spring (37) mounted on said ratchet tooth stem (36) and compressible by said ratchet tooth stem (36) upon lifting of said ratchet tooth stem (36) by said time calibration knob,

19. The time counting assembly with a display for world time zones according to claim 11, further comprising a cover fastened to a back side of said substrate (11), said cover having a stem hole (71) and a battery hole (72) for receiving a part of a time calibration means and a battery (13) respectively.

20. The time counting assembly with a display for world time zones according to claim 11, wherein the time counting assembly is mounted in a casing (8), said casing (8) having a landmark ring (81) at a front side thereof, said landmark ring (81) carrying thereon typical city names corresponding to the 24 time zones, said landmark ring (81) having a plurality of connecting portions (811) to connect said time zone adjustable ring (52), a lens (82) on a front side of said landmark ring (81), a back cover (84) on a back side of said casing (8), said landmark ring (81) moving said time zone adjustable ring (52) and said hour counter (4) for viewing the time in another one of the 24 time zones when rotated.

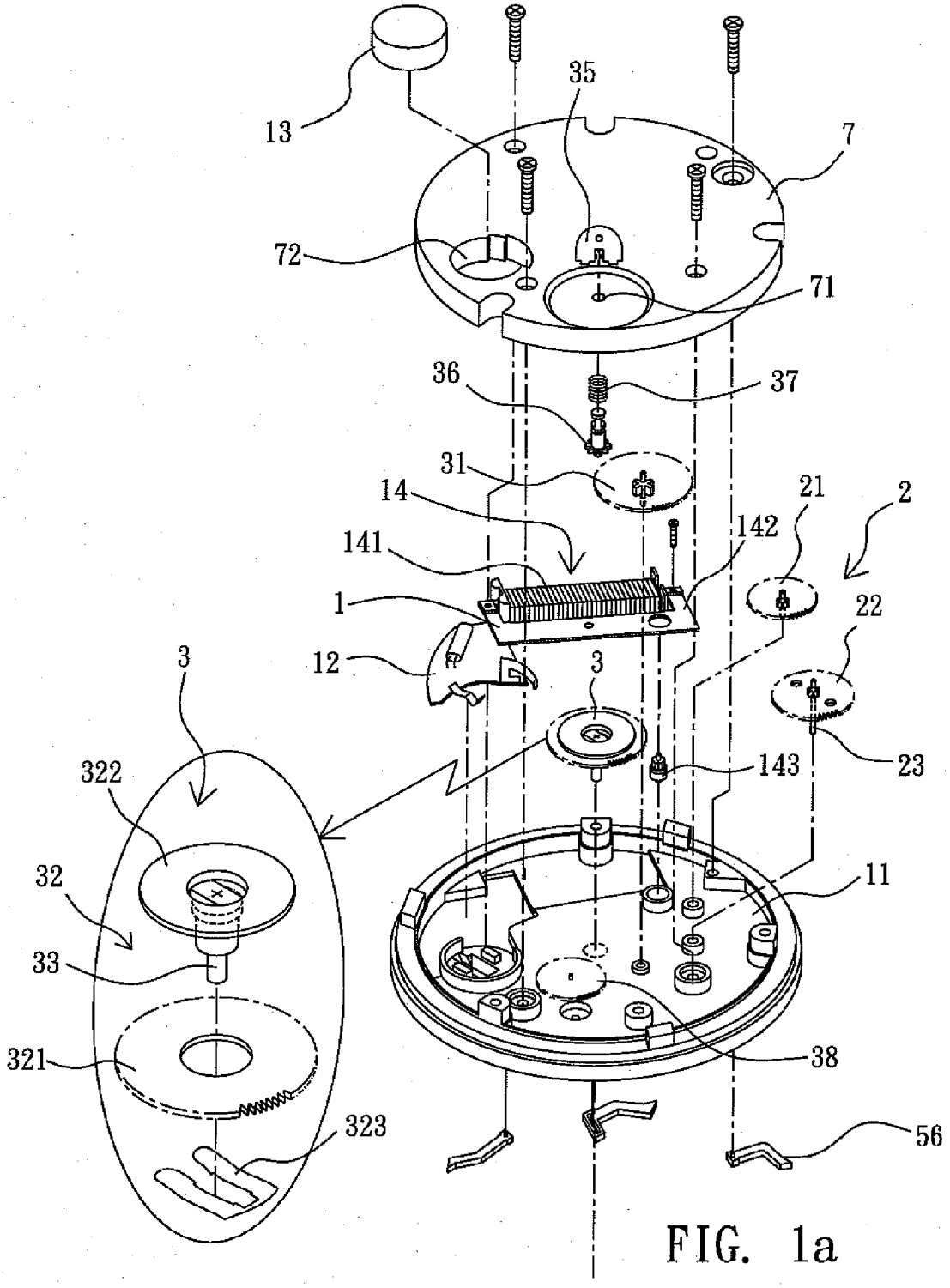
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FIG. 1a

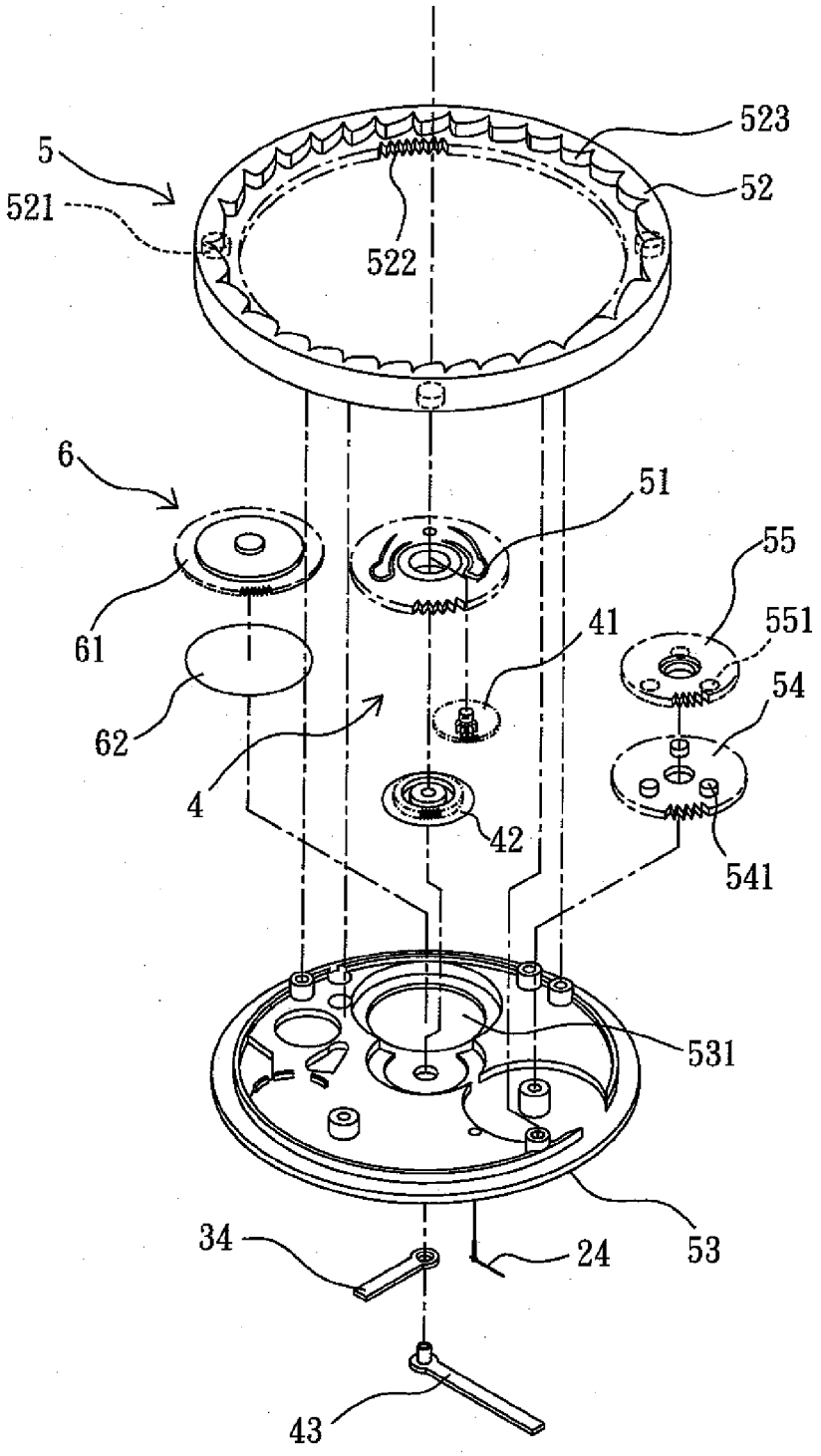


FIG. 1b

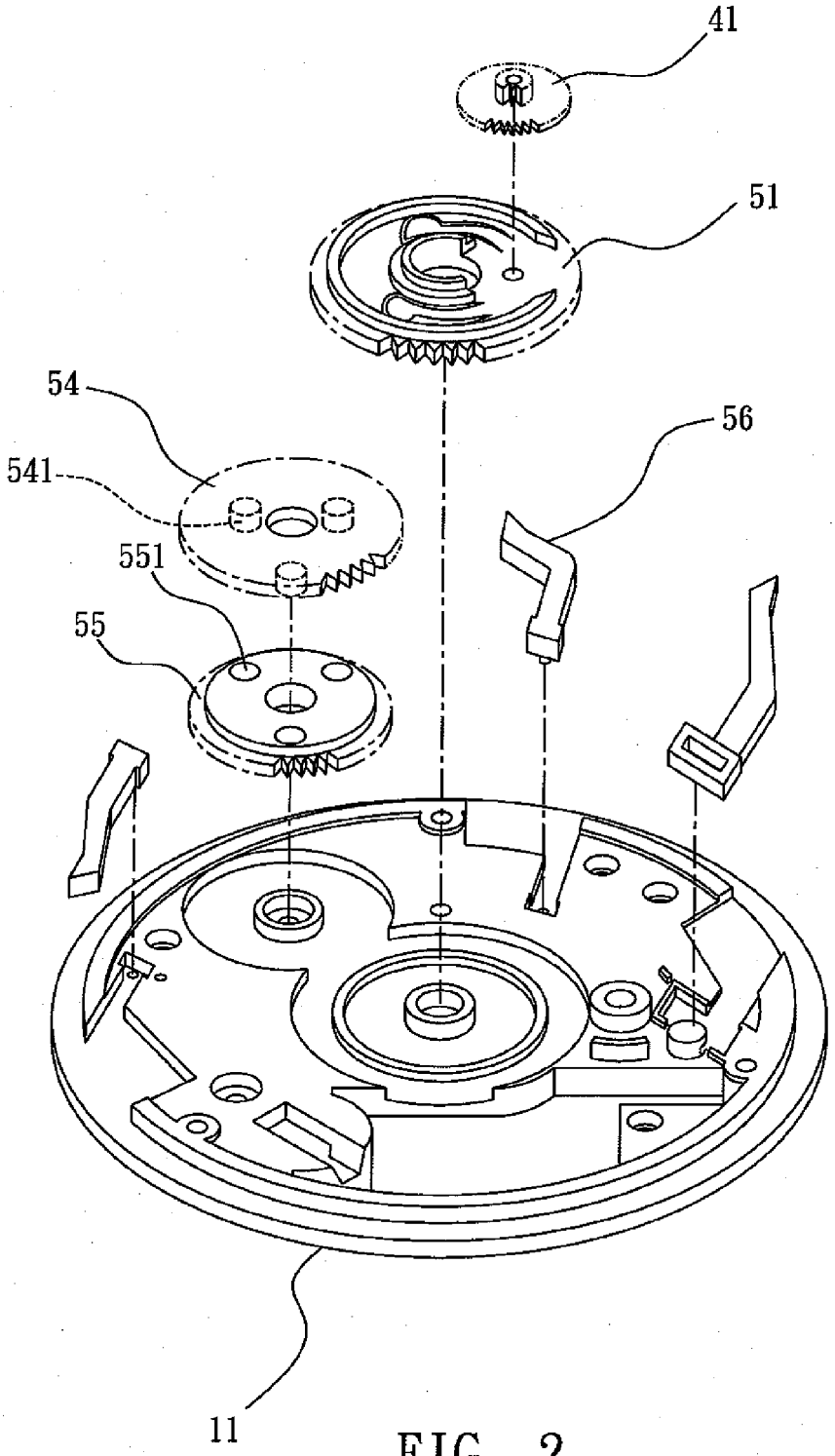


FIG. 2

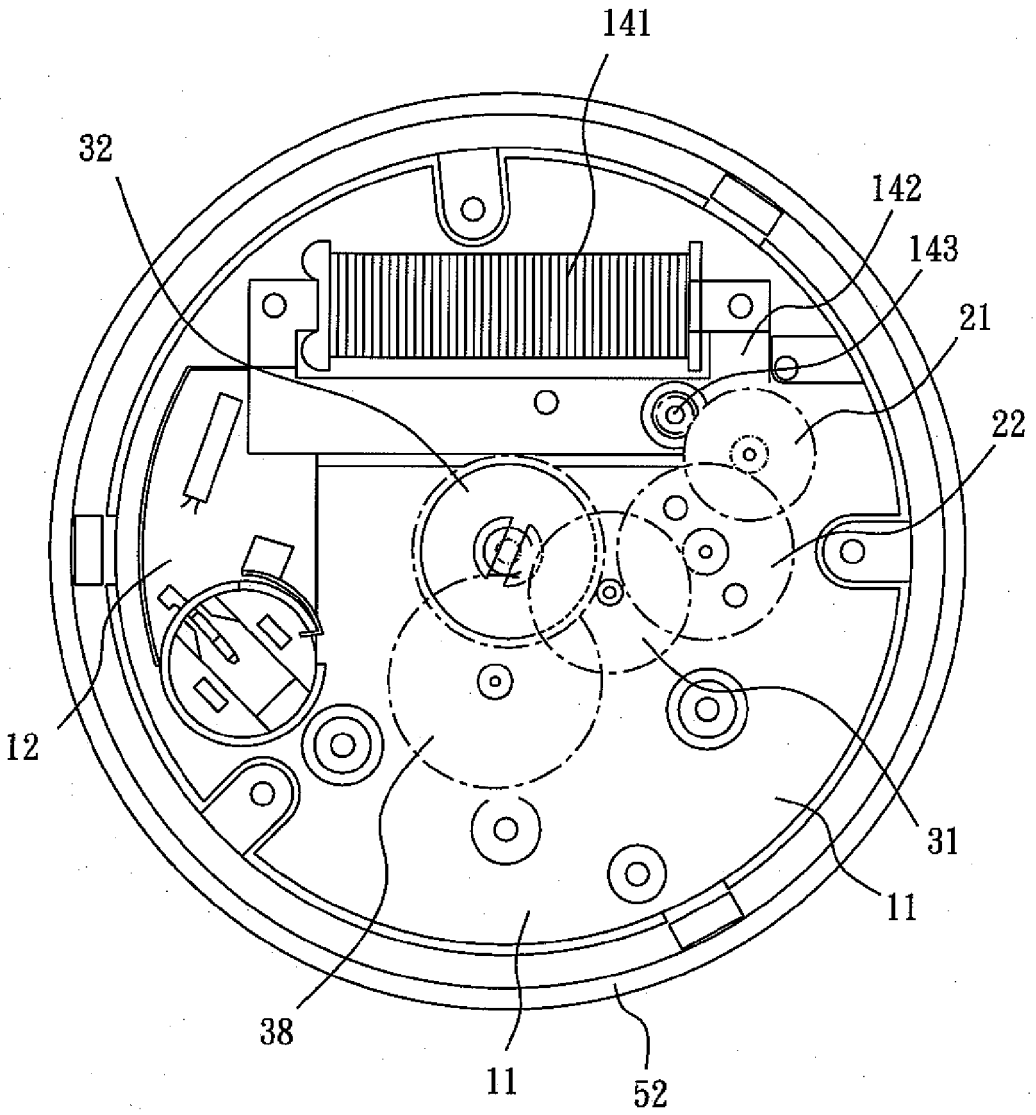


FIG. 3

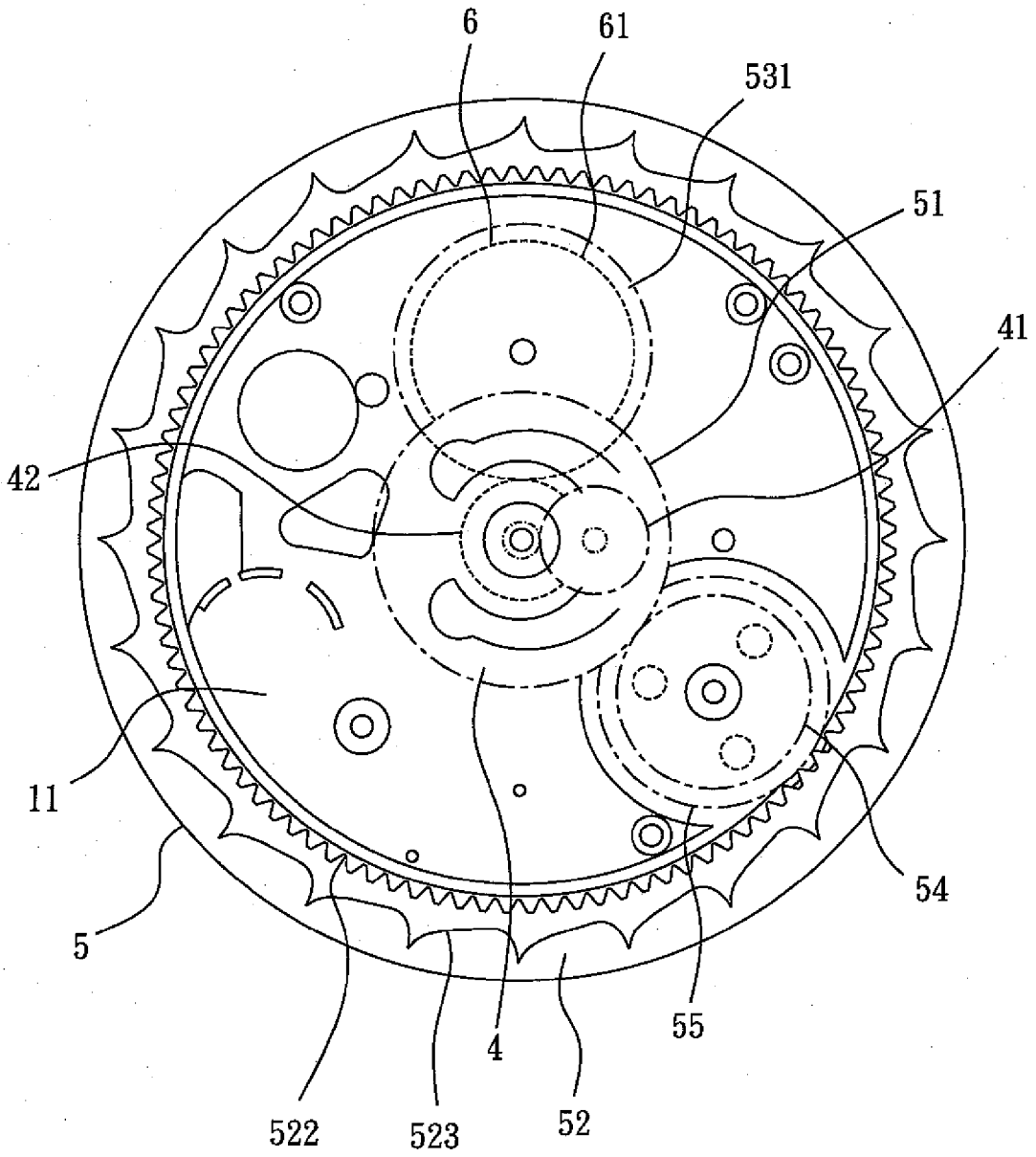


FIG. 4

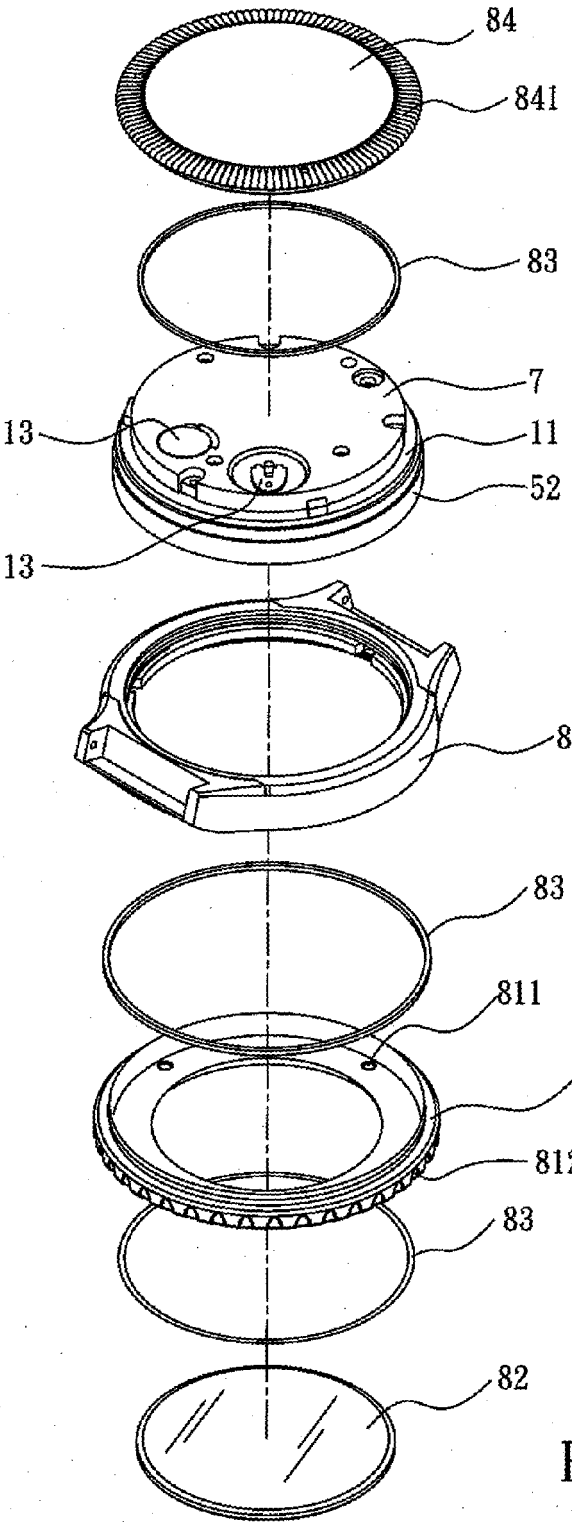
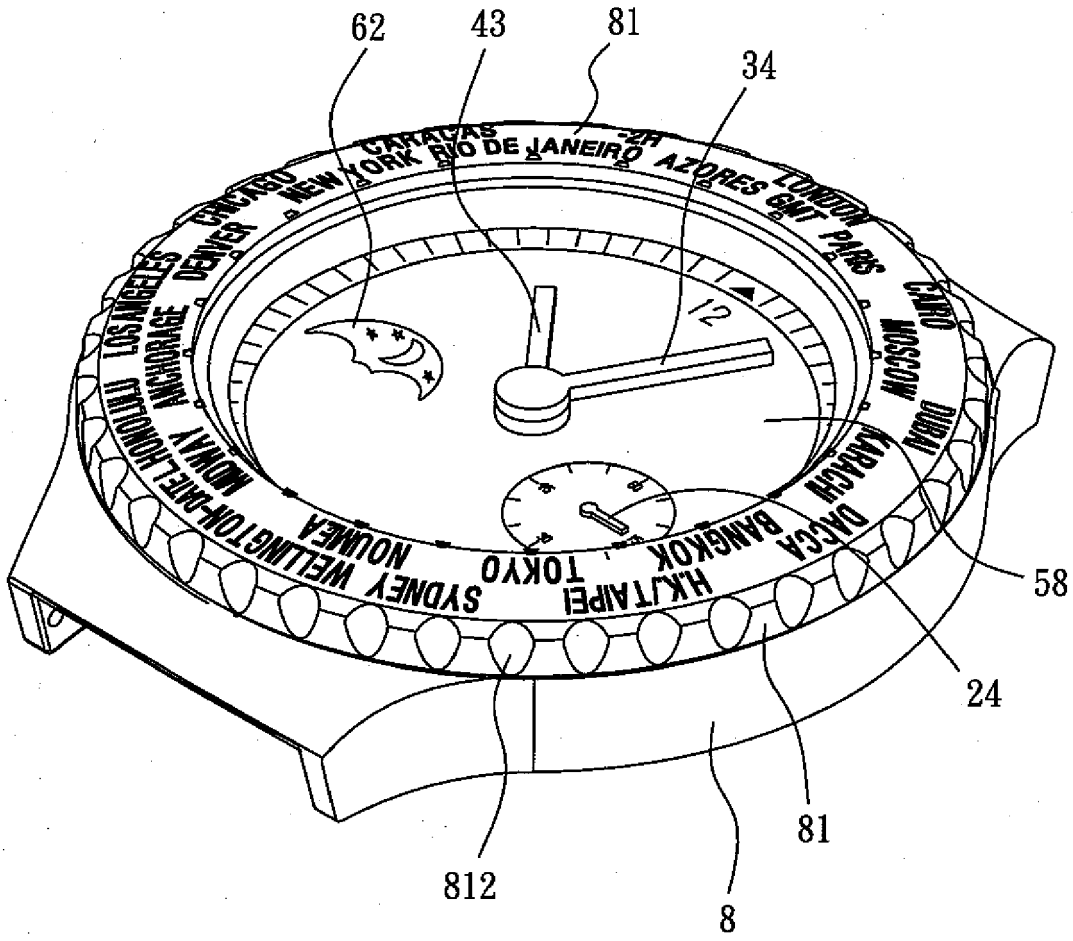


FIG. 5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CAIRO
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DUBAI
KARACHI
DACCA
BANGKOK
H.K./TAIPEI
TOKYO
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NOUMEA
MIDWAY
HONOLULU
ANCHORAGE
LOS ANGELES
DENVER
CHICAGO

FIG. 6

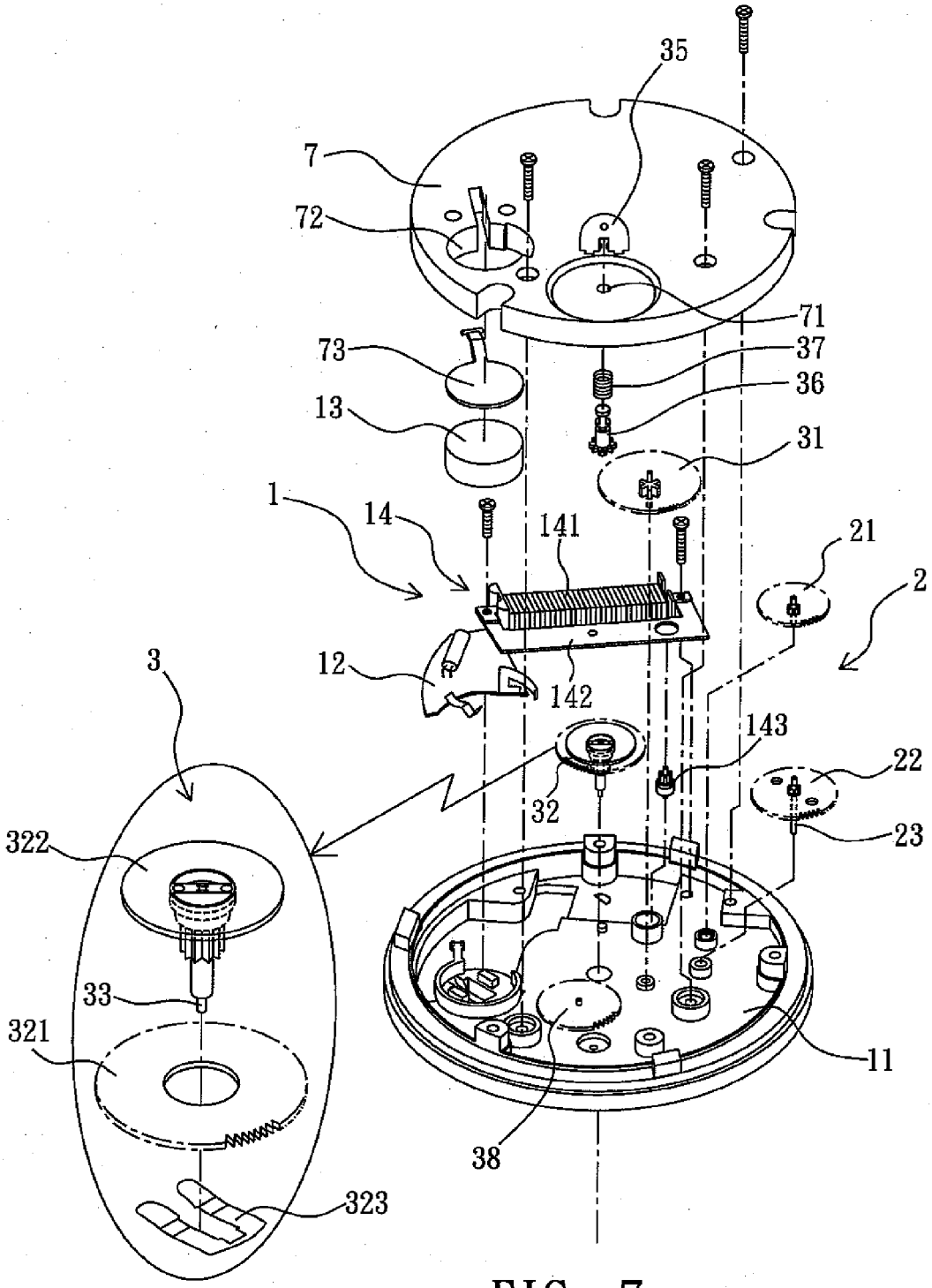
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FIG. 7a

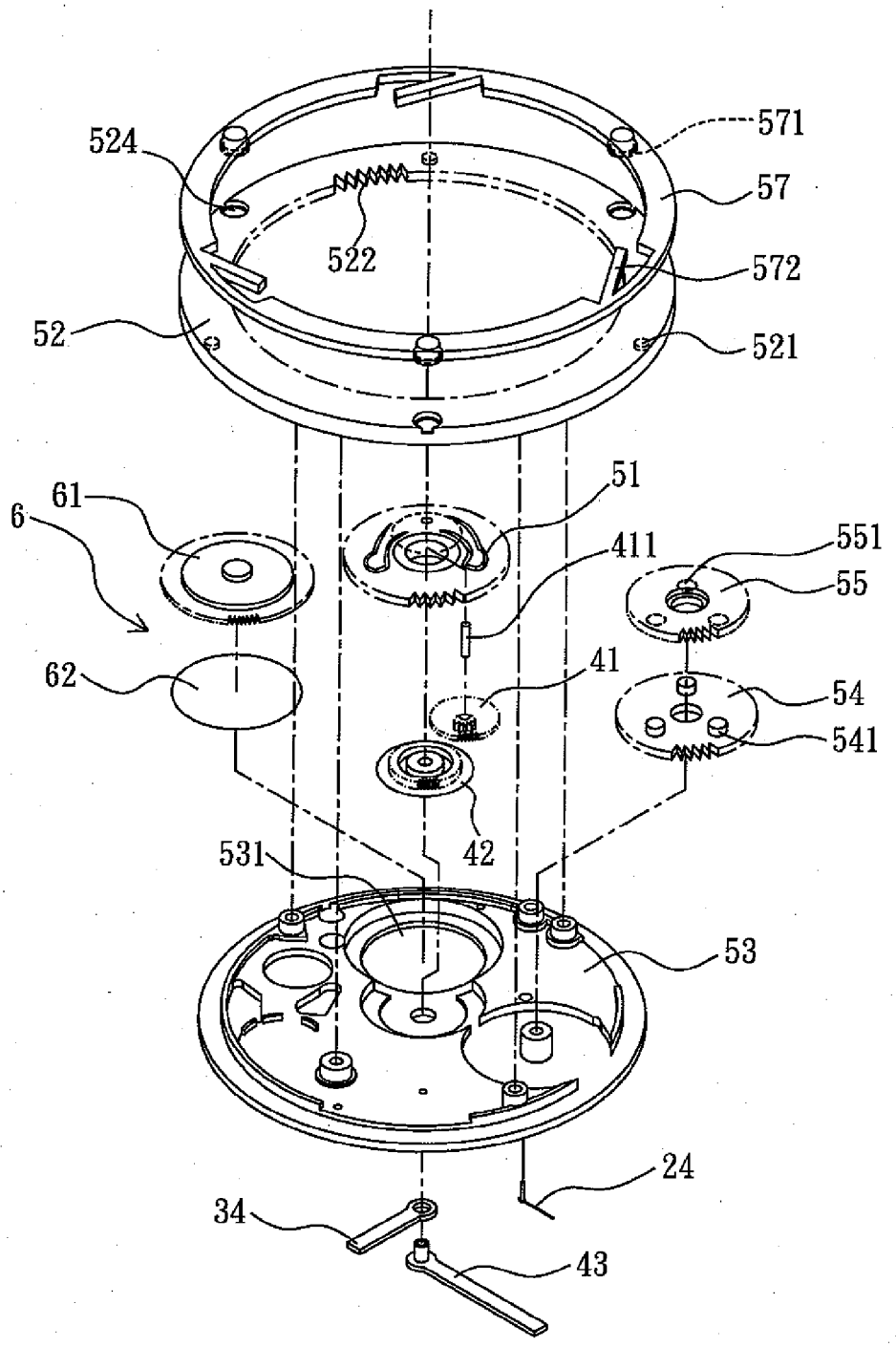
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FIG. 7b

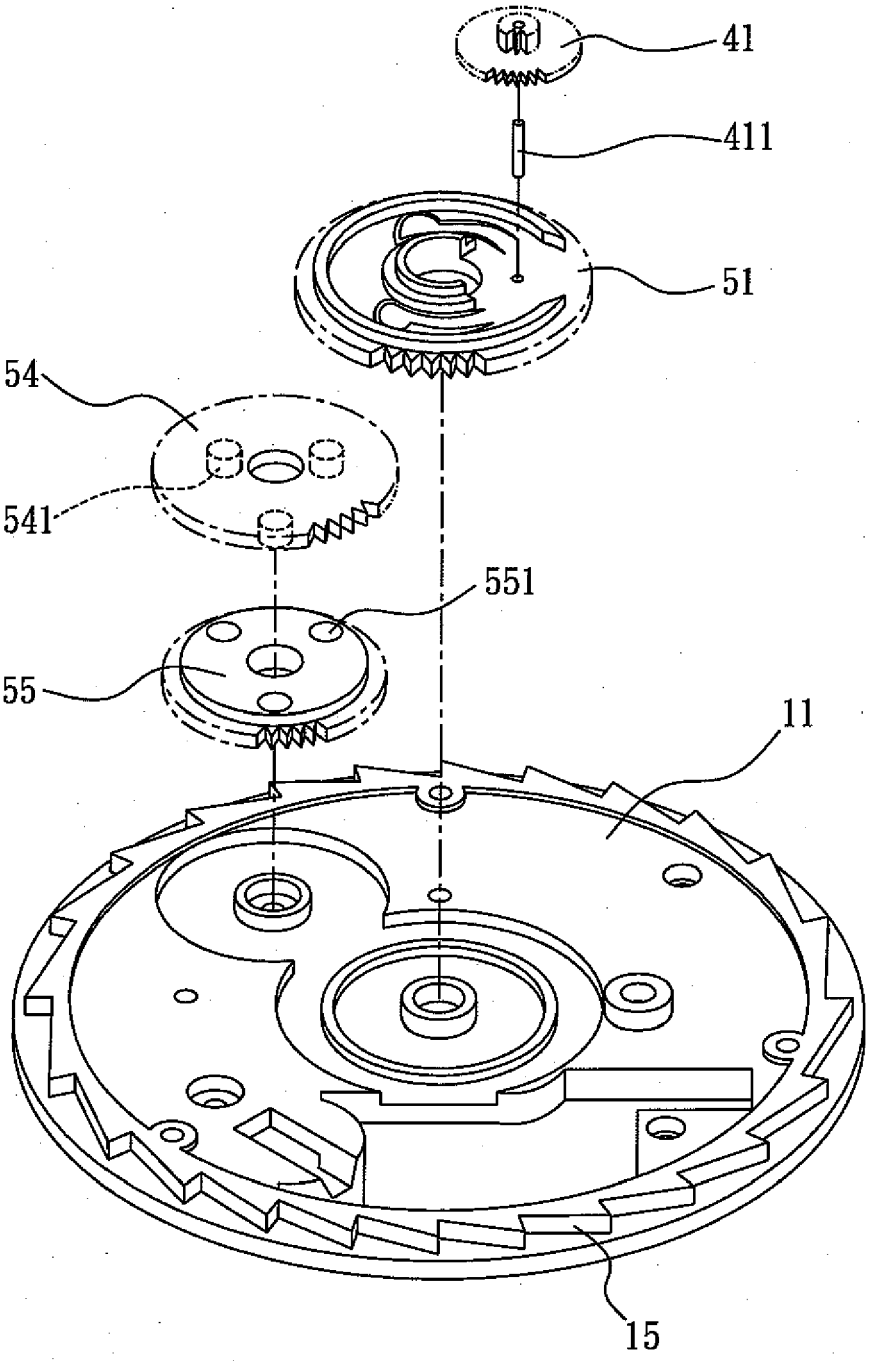


FIG. 8

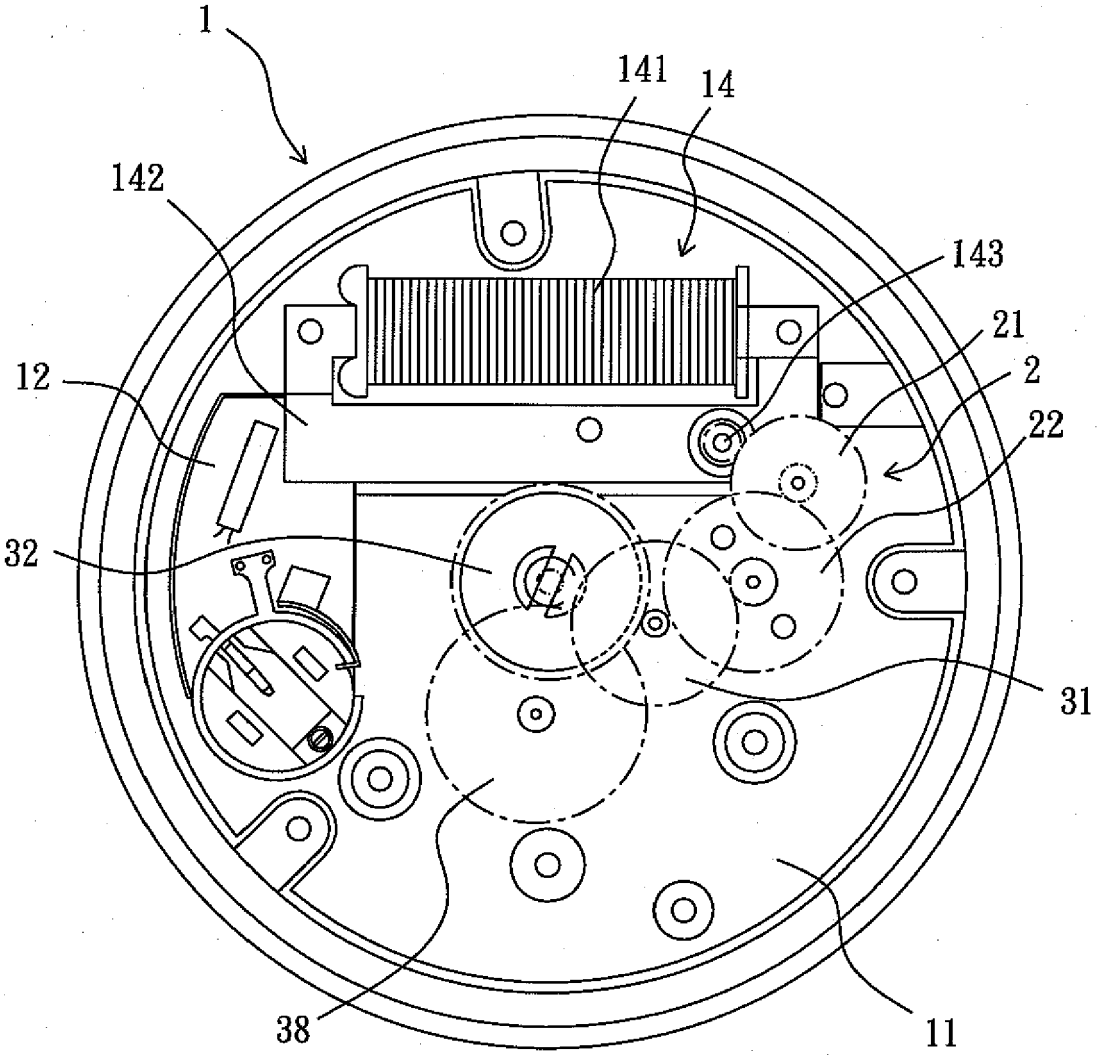


FIG. 9

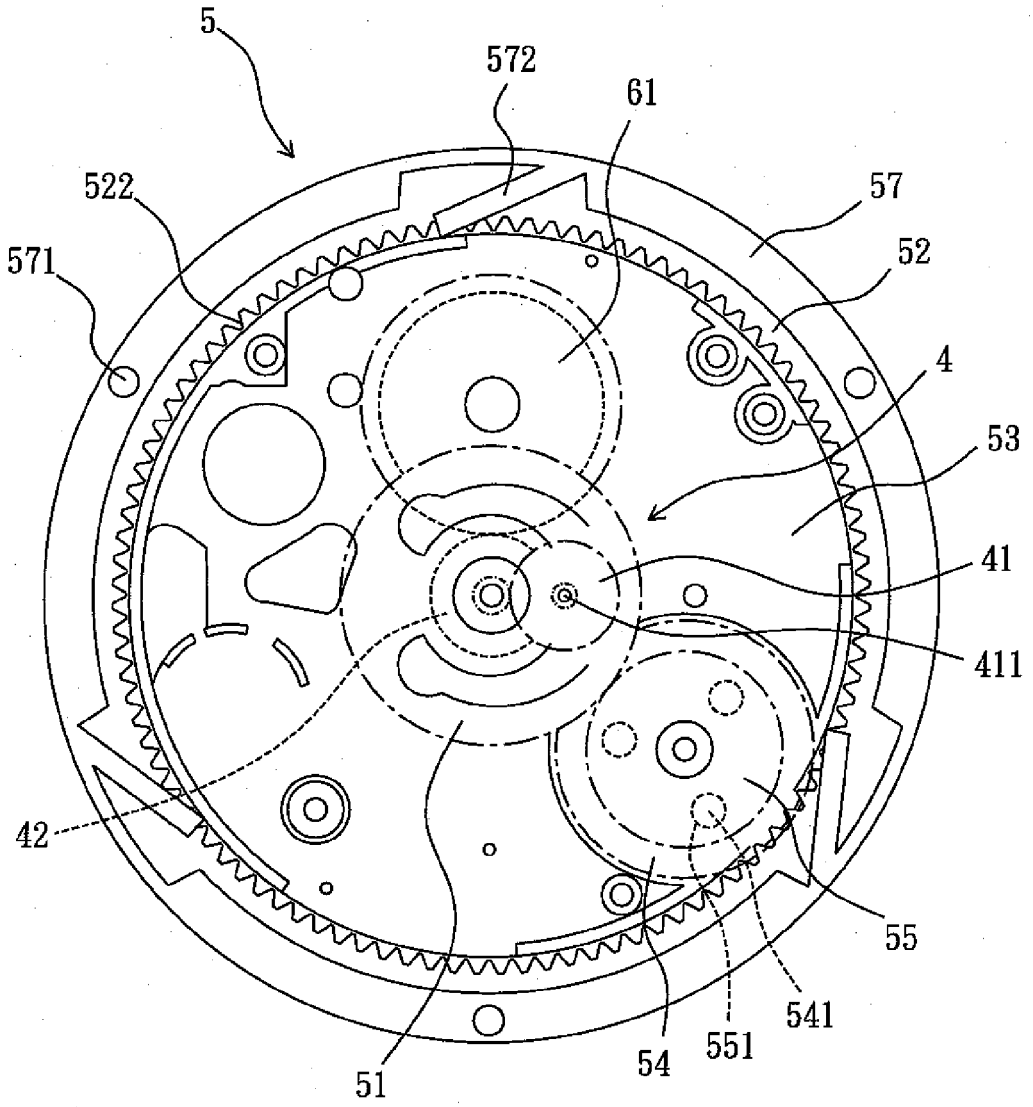


FIG. 10

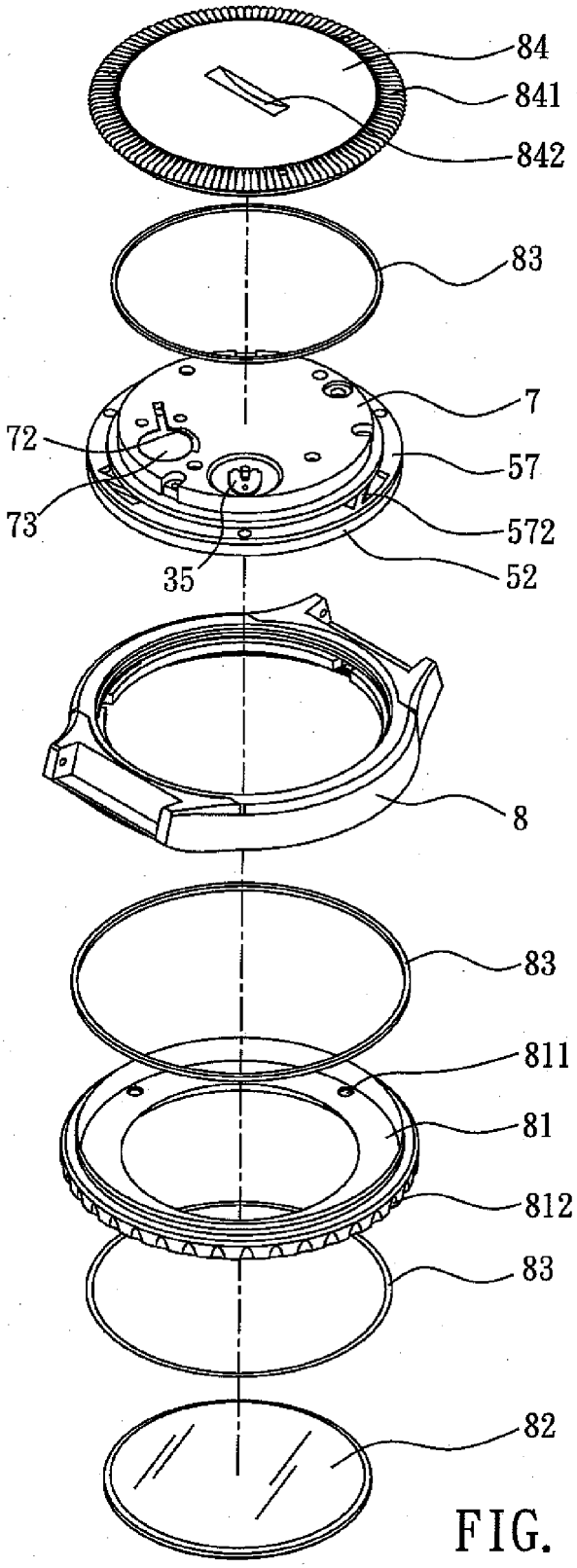
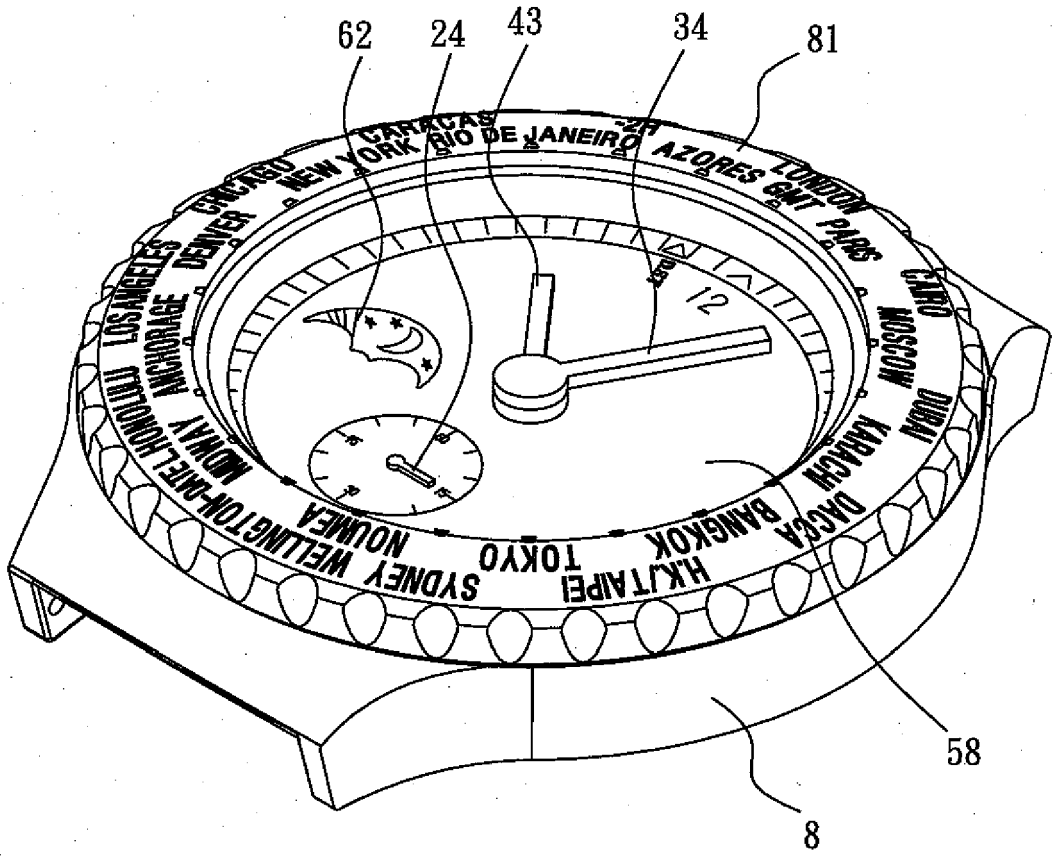


FIG. 11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NOUMEA
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NORFOLK I.
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DENVER
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LOS ANGELES

FIG. 12

REFERENCES CITED IN THE DESCRIPTION

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- US 6636457 B **[0029]**
- CN 01120668 **[0029]**