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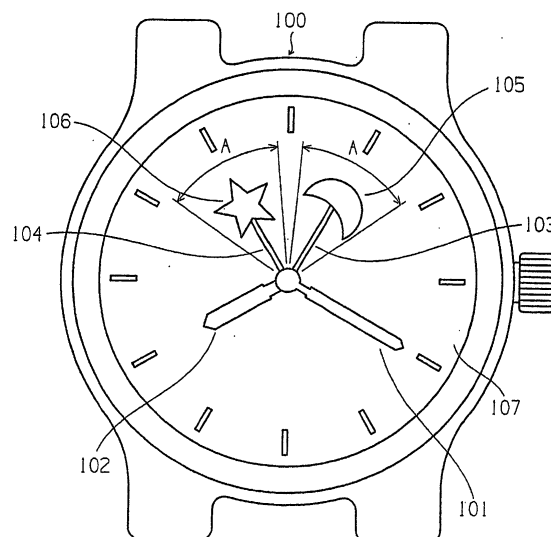
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(54) **ELECTRONIC TIMEPIECE HAVING INDICATION HANDS**

(57) An electronic timepiece with indicator hands having a function of restricting a reciprocal movement range of the indicator hands is utilized to realize a variety of indications, which comprises: time hands (101, 102) for showing time; first and second indicator hands (103, 104) provided separately from the time hands (101, 102); a motor (200) for alternately performing forward rotation and reverse rotation by a predetermined amount; a wheel train for reciprocally rotating the first and second indicator hands (103, 104) in directions opposite from each other within a predetermined range; a support part supporting a wheel constituting the train wheel; and restricting means for restricting the range of rotation of a wheel (211) included in the train wheel to thereby restrict rotation of the indicator hands (103, 104) within a predetermined restriction range; wherein the support part is formed with a space (230) for arranging another wheel (229) such that the other wheel (229) can be arranged in the train wheel in place of the wheel (211) to be restricted in rotation range by the restricting means.

FIG. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to an electronic timepiece with indicator hands integrally formed with figures or the like.

BACKGROUND OF THE INVENTION

[0002] Conventionally, electronic timepieces with indicator hands integrally formed with figures, such as characters, have been utilized.

[0003] In the conventional electronic timepiece with indicator hands, the hand functioning as an indicator hand is structured by a needle-shaped second hand or disk-formed second hand wherein the second hand serves also as the indicator hand. Meanwhile, also in the conventional timepiece having an indicator hand moved only by user's operation, the indicator hand has been used also as a time hand to show time. Alternatively, the indicator hand has been moved by interlocking with the time hand.

[0004] Consequently, in any of the electronic timepieces, there is nothing more than having one indicator hand serving also to show a time. With one indicator hand only, it is impossible to provide a variety of motions to the figure, such as a character, and thus it has been impossible to give a variety of indications.

[0005] Meanwhile, although there have existed the timepieces having indicator hands moving at all times, these are nothing more than merely having a figure or the like on a disk-formed second hand or needle-like second hand. Thus, a variety of indications, e.g. providing a variety of motions, have been impossible to implement.

[0006] Also, where the indicator hand serves also as a time hand or is moved by interlocking with the time hand, the figure or the like integrally formable on the indicator hand is restricted in size by the restriction due to moment of the hand. Thus, it has been impossible to use an indicator hand capable of providing a variety of indications.

[0007] It can be considered as a method of solving this problem and realizing a variety of indications by the indicator hand to provide a plurality of indicator hands separately from the time hands and providing a structure for reciprocally moving the indicator hands. Although it is possible to realize a variety of indications, in the case of merely reciprocally moving the indicator hands, there is a fear that irregular movement of the indicator hand occurs, resulting in irregular movement of indication.

[0008] As a method for solving this problem, it is to be considered to provide a mechanism to restrict the range in which the indicator hand can rotate to a predetermined range in order to prevent occurrence of irregular movement of the indicator hand due to impact or the like. However, by a mechanism for restricting the rotational

range of the indicator hand, there may cause other problems that the indicator hand cannot be moved for other actions, such as other rotational motion, e.g. not reciprocal motion within a predetermined range but monotonously rotating in reverse direction.

[0009] It is an object of the present invention to provide an electronic timepiece with indicator hands capable of realizing a variety of indications by utilizing the electronic timepiece with indicator hands and having a function of restricting the range of reciprocal range of the indicator hands.

DISCLOSURE OF THE INVENTION

[0010] The present invention utilizes the following technological structure in order to achieve the above object.

[0011] That is, an electronic timepiece with indicator hands according to the present invention is characterized by comprising: time hands for showing a time; first and second indicator hands provided separately from the time hands; a motor for alternately performing forward rotation and reverse rotation by a predetermined amount; a wheel train for reciprocally rotating the first and second indicator hands in directions opposite from each other within a predetermined range; a support part supporting a wheel constituting the train wheel; and restricting means for restricting a rotation range of a wheel included in the train wheel to thereby restrict rotation of the indicator hands within a predetermined restriction range; wherein the support part is formed with a space for arranging another wheel such that the other wheel can be arranged in the train wheel in place of the wheel to be restricted in rotation range by the restricting means.

[0012] The forward rotation and reverse rotation of the motor are delivered through the train wheel to the first and second indicator hands to reciprocally rotate the first and second indicator hands in opposite directions to each other within a predetermined range. Where the first and second indicator hands are rotating toward an outside of the restriction range due to impact or the like, the restriction means restricts the rotation. Due to this, indicator hands capable of providing a variety of indications and unstable operation due to jumping of the indicator hands or the like is prevented from occurring. On the other hand, where desiring different operation from the above reciprocal movement, e.g. monotonously rotating the first and second indicator hands in directions opposite from each other, the driver circuit is altered to drive the motor in one direction, and another wheel is arranged in a space previously provided in the support part in place of the wheel to be restricted in rotation range by the restriction means and arranged in the train wheel. Due to this, the first and second indicator hands perform different movement from the reciprocal movement, or movement of monotonously rotating in directions opposite to each other in the above example, thus

making possible a variety of indications.

[0013] Here, the restricting means may comprise a first engaging part fixed in a predetermined position and a second engaging part provided in the wheel to be restricted in the rotation range, the first engaging part and the second engaging part being engaged to thereby restrict rotation of the indicator hands when the indicator hand is rotating toward an outside of the restriction range.

[0014] Also, the train wheel may be structured to reciprocally rotate the first and second indicator hands at the same speed.

[0015] Furthermore, the electronic timepiece may be an electronic wristwatch.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Fig. 1 is a front view showing an outside view of a concrete example of an electronic timepiece with indicator hands according to the present invention.

[0017] Fig. 2 is a rear view of a driving mechanism to be used in the concrete example of the electronic timepiece with indicator hands according to the invention.

[0018] Fig. 3 is an enlarged rear view of a driver mechanism to be used in the concrete example of the electronic timepiece with indicator hands according to the invention.

[0019] Fig. 4 is a B-B sectional view in fig. 2.

[0020] Fig. 5 is a partially enlarged sectional view of Fig. 4

[0021] Fig. 6 is a block diagram of a driver circuit to be used in the concrete example of the electronic timepiece with indicator hands according to the invention.

[0022] Fig. 7 is a timing view for explaining the operation of the driver circuit shown in Fig. 6.

[0023] Fig. 8 is a front view showing an outside view of another concrete example of an electronic timepiece with indicator hands according to the present invention.

[0024] Fig. 9 is a front view showing an outside view of another concrete example of an electronic timepiece with indicator hands according to the present invention.

[0025] Fig. 10 is an E-E sectional view in Fig. 2.

[0026] Fig. 11 is a partially enlarged sectional view of Fig. 10.

BEST MODE FOR CARRYING OUT THE INVENTION

[0027] Hereunder, concrete examples of electronic timepieces with indicator hands according to the present invention will be explained in detail with reference to the drawings.

[0028] Fig. 1 is a front view showing an external view of a concrete example of an electronic timepiece with indicator hands according to the invention, showing an example of electronic wristwatch. In Fig. 1 an electronic wrist watch with indicator hands 100 has time hands of a minute hand 101 and an hour hand 102 to represent a time and provided with a first indicator hand 103

formed integral with a crescent-shaped figure 105 and a second indicator hand 104 formed integral with a star-shaped figure 106. The indicator hands 103, 104 are arranged between the minute hand 101 and hour hand 102 and the dial 107.

[0029] As described hereafter, by using two train wheels having as a drive source a motor different from a motor for driving the time hands 101, 102 to have a reduction ratio corresponding to a second hand and transmitting rotation opposite in direction with respect to the indicator hands 103, 104, a pair of the indicator hands 103, 104 are each driven and rotated such that they respectively reciprocate in opposite direction at the same speed and in the same predetermined angle A.

[0030] Fig. 2 is a rear view showing a driver mechanism of the electronic wrist watch with indicator hands 100 shown in Fig. 1. Fig. 3 is an enlarged rear view showing the driving mechanism of the electronic timepiece with indicator hands shown in Fig. 1. Fig. 4 is a B-B sectional view in Fig. 2 and Fig. 5 is a partially enlarged sectional view of Fig. 4. In the figures, the identical parts are given identical reference numerals.

[0031] In Fig. 2 to Fig. 5, between a support plate 202 and a main plate 201 structuring a support part, there are accommodated the time hands of the minute hand 101 and the hour hand 102, a driving mechanism to rotatively driving the pair of indicator hands 103, 104 and an electronic circuit. Concretely, they are structured as described below.

[0032] A first stepping motor 200 structured by a coil 203, a stator 204 and a rotor magnet 205, is a well-known stepping motor for a timepiece (see, for example, Japanese Patent Laid-open No. 127365/1979). As described later, this provides forward rotation drive and reverse rotation drive so as to reciprocally rotate the indicator hands 103, 104 in directions opposite to each other within a predetermined range (in an angular range A in Fig. 1). The stator 204 and coil 203 are fixed on the main plate 201 with screws 207, 208.

[0033] The rotor magnet 205 has a gear 206 which is in mesh with a gear 301 of a wheel 209. The wheel 209 has a pinion 302 which is in mesh with a gear 303 of a wheel 210. Also, the gear 303 of the wheel 210 is in mesh with a gear 306 of an hour wheel 212 to rotatively drive the indicator hand 103.

[0034] On the other hand, a pinion 304 of the wheel 210 is in mesh with a gear 305 of a wheel 211 for reverse rotation. Also, the gear 305 of the wheel 211 is in mesh with a gear 307 of the hour wheel 213 to rotatively drive the indicator hand 104.

[0035] The wheel 211 has an elongate hole 225 formed along a circumferential direction thereof. Due to this, ends 227, 228 are formed as a second engaging part in the wheel 211. A pin member 226 as a first engaging part is inserted through the hole 225, which is planted and fixed in a predetermined position on the main plate 201. The ends 227, 228 of the wheel 211 and the pin member 226 constitute restricting means to re-

strict the range of rotation of the indicator hands 103, 104. When the indicator hands 103, 104 are about to rotate outside the predetermined restricting range (e.g. angular range A in Fig. 1), the pin member 226 and the end 227, 228 of the wheel 211 comes into engagement to structurally restrict the rotation of the indicator hands 103, 104.

[0036] Meanwhile, the wheels 209, 210 and the hour wheel 212 constitute a first train wheel to deliver rotation reverse to a rotational direction of the stepping motor 200 (i.e. rotational direction of the rotor magnet 205) to the first indicator hand 103. The wheels 209, 210, 211 and the hour wheel 213 constitute a second train wheel which delivers rotation in the same direction as a rotational direction of the stepping motor 200 to the second indicator hand 104. Here, formed the same are the gear ratio of the first train wheel of from the pinion 302 of the wheel 209 to the gear 306 of the hour wheel 212 and the gear ratio of the second train wheel of from the pinion 302 of the wheel 209 to the gear 307 of the hour wheel 213. The indicator hand 103 and the indicator hand 104 are structured such that they are driven and rotated at the same speed in directions opposite to each other. This rotatively drives the crescent-shaped figure 105 formed integral with the indicator hand 103 and the star-shaped figure 106 formed integral with the indicator hand 104 at the same speed in directions opposite to each other.

[0037] Incidentally, the stepping motor 200, the wheels 209, 210, 211, the hour wheels 212, 213 constitute rotation means for reciprocally rotating the first and second indicator hands 103, 104 oppositely in a predetermined range.

[0038] In the meanwhile, where the indicator hands 103, 104 are to be rotated in another way, i.e. where continuously rotated the indicator hands 103, 104 are to be in directions opposite to each other in a monotonous fashion, the stepping motor 200 has to be driven and rotated only in one direction. Furthermore, each wheel requires change of rotation without restriction. At this time, it is easy to change the way of rotation for the stepping motor 200. However, because of the provision of the pin member 226, a wheel having no hole 225 cannot be arranged for replacement to a position of the wheel 211.

[0039] In order to solve this problem, the present embodiment provides a space 230 to arrange a wheel 229 instead of the wheel 211 on the main plate 201, as shown by the broken line in Fig. 2 and Fig. 3. The wheel 229 is a wheel structurally the same as the wheel 211 and to be used in place of the wheel 211. In the case the wheel 211 is removed and the wheel 229 is used, the wheels 209, 210, 229 and the hour wheel 213 constitute a third train wheel to deliver rotation in the same direction as the rotational direction of the stepping motor 200 (i.e. rotational direction of the rotor magnet 205). Here, the main plate 201 is not formed with an engaging part for engaging the wheel 229 and there is no restric-

tion of rotation. Thus, the indicator hands 103, 104 are controlled in rotation movement in accordance with rotation of the stepping motor 200. Incidentally, because the wheel 229 is not restricted in rotation, the wheel 229 can use a wheel having no hole. However, where other movement is required, e.g. restricting the rotation of the wheel 229, the wheel having a hole 229 can be utilized as it is.

[0040] On the other hand, the electronic wristwatch 100 has drive means for rotatively driving the time hands of the minute hand 101 and the hour hand 102. That is, it is provided with a stepping motor 222 which is structured by a coil 219, a stator 220 and a rotor magnet 221. Further, a fourth train wheel structured by a wheel 214 to rotatively drive wheels 223, 224 for delivering rotation of the rotor magnet 221 and the minute hand 101 and an hour wheel 215 to rotatively drive the hour hand 102.

[0041] The wheels 209, 210, 211 structuring each train wheel are rotatably supported by the support plate 202. Also, the hour wheels 212, 213, 215 are arranged concentric on a shaft 216 formed integral with the wheel 214.

[0042] Also, an electronic circuit is incorporated which comprises an integrated circuit 217 incorporating therein a quartz oscillator 218 and driver circuit constituting an oscillator circuit.

[0043] Fig. 6 is a block diagram of a driver circuit 600 used in one embodiment of an electronic timepiece with indicator according, to the invention, wherein the same reference numerals are given to the same parts of Fig. 2 to Fig. 5. In Fig. 6, the driver circuit 600 has an oscillator circuit 601 comprising a quartz oscillator 218 or the like, a system clock generating circuit 602 for generating a system clock from an output signal from the oscillator circuit 601, a non-volatile read only memory (ROM) 603 storing programs and motor driving pulses, described hereafter, and constituting storage means, a central processor unit (CPU) 604 to be operated by a program stored in the ROM 603 in response to a system clock from the system clock generating circuit 602 and performs various operations and driving and controlling of the stepping motor 200, 222, a driver circuit 605 for supplying a drive signal to the stepping motor 200, 222, a stepping motor 200 for driving and rotating the indicator hands 103, 104, and a stepping motor 222 for driving and rotating the minute hand 101 and the hour hand 102.

[0044] The ROM stores a drive pulse waveform shown in Fig. 7. Where driving the stepping motor 200 forward and reverse, the CPU 604 reads the drive pulse out of the ROM 603 and drive the stepping motor 200 forward and reverse through the driver circuit 605 (see, for example, the aforesaid Japanese Patent Laid-open publication, for example).

[0045] That is, in Fig. 7, where the stepping motor 200 is rotated forward, it is rotated forward by applying a pulse with a time width P1 to a terminal OUT1 as shown in Fig. 7(a). Next, a pulse with a time width P1 is applied

to a terminal OUT2 to cause forward rotation. This is alternately repeated by one period (e.g. 10 times of forward rotation), thereby repeating forward rotation of the stepping motor 200.

[0046] Also, in that case of rotating the stepping motor 200 reverse, first a demagnetizing pulse with a time width PE is supplied to the terminal OUT1 as shown in Fig. 7(b). After a lapse of a time PS, a pulse with a time width P1 is supplied to once cause forward rotation. Thereafter, a pulse with a time width P2 for reverse rotation is supplied to the terminal OUT2, and thereafter a pulse with a time width P3 for reverse rotation is supplied to the terminal OUT1. This causes the stepping motor 200 to rotate reverse. The above operation is made by one period (e.g. 10 times of reverse rotation).

[0047] Thereafter, forward rotation and reverse rotation as above, by one period each, are alternately made to cause the stepping motor 200 to rotate forward and reverse by a same predetermined amount a time. This is repeated.

[0048] This rotatively drive the rotor magnet 205 of the stepping motor 200 alternately in forward and reverse directions by a same amount a time.

[0049] If the stepping motor 200 is rotated forward (in the arrowed direction in Fig. 3) by a predetermined number of times, the wheel 209, the wheel 210, and the hour wheel 212 rotate in respective arrowed directions. Due to this, the indicator hand 103 rotates by an angular range A in the arrowed direction (clockwise). Simultaneously, the wheel 211 in mesh with the wheel 210 rotates in the arrowed direction to rotate the hour wheel 213 in the arrowed direction, rotating the indicator hand 104 by the angular range A in the arrowed direction (counterclockwise).

[0050] Next, when the stepping motor 200 rotates reverse (in a direction opposite to the arrow in Fig. 3) by the predetermined number of times, the wheel 209, the wheel 210, and the hour wheel 212 rotate in a direction opposite to the arrow. Due to this, the indicator hand 103 rotates by the angular range A. Simultaneously, the wheel 211 in mesh with the wheel 210 rotates in a direction opposite to the arrow. This causes the hour wheel 213 to rotate in a direction opposite to the arrow, rotating the indicator hand 104 by the angular range A in the direction opposite to the arrow (clockwise).

[0051] Thereafter, the above movement is repeated. Due to this, the crescent-shaped figure 105 integral with the indicator hand 103 and the star-shaped figure 106 integral with the indicator hand 104 reciprocally move at the same speed in directions opposite to each other in the same angular range A. Incidentally, the range of rotation of the indicator hand 103, 104, i.e. the range of rotation angle A in Fig. 1 is determined by the amount (number) of forward and reverse rotation of the stepping motor 200. By setting a rotation amount of the stepping motor 200 in various ways, the rotational range of the indicator hand 103, 104 can be set variously. Accordingly, it is possible to reciprocally rotate the crescent fig-

ure 105 and the star figure 106 in a variety of ranges.

[0052] When the indicator hands 103, 104 are reciprocally move normally within the angular range A in the above manner, in the event that the indicator hand 103, 104 irregularly move due to mechanical impact or the like and moves toward an outside of the angular range A, the wheel 211 rotates due to rotation of the indicator hands 103, 104. However, the ends 227, 228 of the wheel 211 formed by the hole 225 engages the pin member 226, thus restricting the indicator hand 103, 104 from rotating furthermore. This can prevent the indicator hands 103, 104 from moving abnormally.

[0053] Fig. 8 is a front view showing an external view of another concrete example of an electronic timepiece with indicator hands according to the invention. The identical parts to Fig. 1 are given the identical reference numerals.

[0054] In Fig. 8, an electronic wristwatch with indicator hands 100 has time hands comprising a minute hand 101 and an hour hand 102 and provided with a first indicator hand 103 formed integral with an arrowed figure 801 and a second indicator hand 104 formed integral with a heart-shaped figure 802. The indicator hands 103, 104 are arranged between the minute hand 101 and the hour hands 102 and the dial 107. The a pair of indicator hands 103, 104 are each driven and rotated to reciprocally move at the same speed in directions opposite to each other within the same predetermined range of angle C.

[0055] Fig. 9 is a front view showing an external view of another concrete example of an electronic timepiece with indicator hands according to the invention. The identical parts to Fig. 1 and Fig. 8 are given the identical reference numerals.

[0056] In Fig. 9, an electronic timepiece with indicator hands 100 has time hands comprising a minute hand 101 and an hour hand 102 and also is provided with a first indicator hand 103 formed integral with an arrowed figure 801 and a second indicator hand 104 formed integral with a heart-shaped figure 802. The indicator hands 103, 104 are arranged between the minute hand 101 and hour hands 102 and the dial 107. A pair of indicator hands 103, 104 are each driven and rotated to reciprocally move at the same speed in directions opposite to each other within the same predetermined range of angle D.

[0057] As shown in Fig. 1, Fig. 8, and Fig. 9, a variety of representations can be provided by making the figures put on the indicator hands 103, 104 with various figures such as characters or letters, changing the attaching angle to the indicator hand 103, 104 or changing the range of rotational angle of the indicator hand 103, 104.

[0058] Next, where the indicator hands 103, 104 are to be rotated in movement other than the reciprocal movement, e.g. where the indicator hands 103, 104 are to be rotated monotonously in directions opposite to each other, the wheel 211 is removed and a wheel 229

is attached and used in place thereof in a space 230 of a support part 202 as shown by the broken line in Fig. 2 and Fig. 3.

[0059] Also, due to this, the motor 200 is driven and rotated only in one direction. For example, the ROM 603 of Fig. 6 is replaced with the ROM storing only the forward rotation pulse of Fig. 7(a), and the pulse stored in the ROM is read out by a CPU 604 to rotatively drive the motor 200, thereby driving and rotating the motor 200 only in one forward direction. Alternatively, the ROM 603 of Fig. 6 is replaced with the ROM storing only the reverse rotation pulse of Fig. 7(b), and the pulse stored in the ROM is read out by the CPU 604 to rotatively drive the motor 200, thereby driving and rotating the motor 200 only in one reverse direction.

[0060] Fig. 10 is an E-E sectional view of Fig. 2 showing a structure in which that the wheel 211 is replaced with a wheel 229 as stated above, and Fig. 11 is an enlarged sectional view of Fig. 10. In Fig. 10 and Fig. 11, the identical parts to Fig. 1 to Fig. 5 are given the identical reference numerals. Explanation is made below mainly on the parts different from them.

[0061] In Fig. 10 and Fig. 11, the rotation of the rotor magnet 205 is delivered to the hour wheel 212 for driving and rotating the indicator hand 103 through the gear of the rotor magnet 206, the gear 301 of the wheel 209, the pinion 302 of the wheel 209 and the gear 303 of the wheel 210. Due to this, the indicator hand 103 rotates reverse to the rotor magnet 205.

[0062] Also, the rotation of the rotor magnet 205 is delivered to the hour wheel 213 for driving and rotating the indicator hand 104 through the gear of the rotor magnet 206, the gear 301 of the wheel 209, the pinion 302 of the wheel 209 and the gear 308 of the wheel 229. Due to this, the indicator hand 104 rotates in the same direction as the rotor magnet 205.

[0063] As described before, if the motor 200 is rotated only in one direction, there is no restriction by the restricting means. Accordingly, the figure integrally provided on the indicator hand 103 (the crescent figure 105 in Fig. 1, or the arrowed figure 801 in Fig. 8 and Fig. 9) is repeatedly rotated reverse to the stepping motor 200, and the figure integrally provided on the indicator hand 104 (the star figure 106 in Fig. 1, or the heart-shaped figure 802 in Fig. 8 and Fig. 9) is repeatedly rotated in the same direction as the stepping motor 200. This can provides different display from the reciprocal movement stated before.

[0064] As stated above, the electronic wristwatch with indicator hands 100 according to the concrete example of the invention is characterized by having, particularly, the time hands 101, 102 to show a time, the first and second indicator hands 103, 104 provided separate from the time hands 101, 102, the stepping motor 200 to rotate forward and reverse by a predetermined amount a time, the train wheel for delivering rotation of the stepping motor 200 and reciprocally rotating the first and second indicator hands 103, 104 in directions op-

posite to each other within a predetermined range, the support part (the main plate 201, the support plate 202) supporting the wheels constituting the train wheel, and the restricting means (the pin member 226, the ends 227, 228) for restricting range of the wheel 211 included in the train wheel to thereby restrict the rotation of the indicator hands 103, 104 in a predetermined restriction range, wherein the support part is formed with the space 230 for arranging the other wheel 229 to enable the provision of the other wheel 229 in the train wheel in place of the wheel 211 to be restricted in rotation range by the restricting means.

[0065] Accordingly, where the wheel 211 is used, a variety of representations are possible by the reciprocal motion of the indicator hands 103, 104. Furthermore, it is possible to provide an electronic wristwatch 100 with indicator hands capable of restricting the indicator hands 103, 104 from abnormally moving due to impact or the like.

[0066] For example, it is possible to represent movement of action in a certain predetermined range, e.g. integrally forming character's hands or legs on each of two indicator hands 103, 104, and to restrict the indicator hands 103, 104 from abnormally moving. Also, where integrally forming figures of both hands on the indicator hands 103, 104, the both hands may be reciprocally moved in a rattling fashion in a predetermined range of movement or the indicator hands 103, 104 may be set variously in attaching angle, thereby making it possible to represent such motion that the character shows largely waving its hand or clapping its hands and restrict the indicator hands 103, 104 from abnormally moving.

[0067] Furthermore, by arranging the indicator hands 103, 104 between the time hands (minute hand 101, hour hand 102) and the dial 107, these can be provided with a sense of unity with the design on the dial 107.

[0068] Meanwhile, with altering by removing the wheel 211 and attaching another wheel 229 in the space 230 of the support plate 202 as well as altering to make the motor 200 perform other rotational movement, an electronic wristwatch with indicator hands 100 can be provided having indicator hands 103, 104 capable of indicating in further various ways. For example, if the motor 200 is altered to rotatively drive only in one direction, it is possible to change the motion of the first and second indicator hands 103, 104 to different motion from the reciprocal motion within a predetermined range, i.e. motion of monotonously rotating in directions opposite to each other. Thus, an electronic wristwatch with indicator hands 100 can be provided having indicator hands 103, 104 capable of indicating in further various ways.

[0069] Also, by structuring the diameter or gear or tooth count of the wheel 229 same as or different from the wheel 211, further a variety of indications are made possible.

[0070] Incidentally, in each of the above-described concrete examples, although the motor used a stepping motor 200 for timepieces structured by the coil 203, the

stator 204 and the rotor magnet 205, a motor of another structure may be used.

[0071] Also, in each of the above-described concrete examples, although the indicator hands 103, 104 were made to rotate at the same speed, they may be rotated at speeds different from each other. 5

[0072] Furthermore, in each of the above-description concrete examples, although the indicator hands 103, 104 were same in rotation range, different ranges may be given. 10

[0073] Furthermore, in each of above-described the concrete examples, the time hands were structured by the minute hand 101 and the hour hands 102, a second hand may be added thereto.

[0074] Also, although the restricting means was structured by the ends 227, 228 of the wheel 211 and the pin member 226 fixed on the main plate 201, the pin member 226 may be formed on the side of the support plate 202. It is also possible to form a pin member on the wheel 211 and structurally form a hole or recess in the main plate 201 or support plate 202. The restricting means can adopt a variety of structures capable of restricting the rotation range of the indicator hands 103, 104 to a predetermined restriction range. 20

25

INDUSTRIAL APPLICABILITY

[0075] As described above, the electronic timepiece with indicator hands according to the present invention is applicable to various electronic timepieces beginning from electronic wristwatches to wall-type electronic timepieces and desk-top electronic timepieces. 30

Claims

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1. An electronic timepiece with indicator hands comprising: time hands (101, 102) for showing time; first and second indicator hands (103, 104) provided separately from said time hands (101, 102); a motor (200) for alternately performing forward rotation and reverse rotation by a predetermined amount; a wheel train for reciprocally rotating said first and second indicator hands (103, 104) in directions opposite from each other within a predetermined range; a support part supporting a wheel constituting said train wheel; and restricting means for restricting range of in which rotation of a wheel (211) included in said train wheel to thereby restrict rotation of said indicator hands (103, 104) within a predetermined restriction range; said support part being formed with a space (230) for arranging another wheel (229) such that said other wheel (229) can be arranged in said train wheel in place of said wheel (211) to be restricted in rotation range by said restricting means. 40 45 50 55

2. An electronic timepiece with indicator hands ac-

cording to claim 1, wherein said restricting means comprises a first engaging part (226) fixed in a predetermined position and a second engaging part (227, 228) provided in said wheel (211) to be restricted in said rotation range, said first engaging part (226) and said second engaging part (227, 228) being engaged to thereby restrict rotation of said indicator hands (103, 104) when said indicator hands (103, 104) are rotating toward an outside of said restriction range.

3. An electronic timepiece with indicator hands according to claim 2, wherein said train wheel is structured to reciprocally rotate said first and second indicator hands (103, 104) at the same speed.

4. An electronic timepiece with indicator hands according to claim 3, wherein said electronic timepiece is an electronic wristwatch (100).

FIG. 1

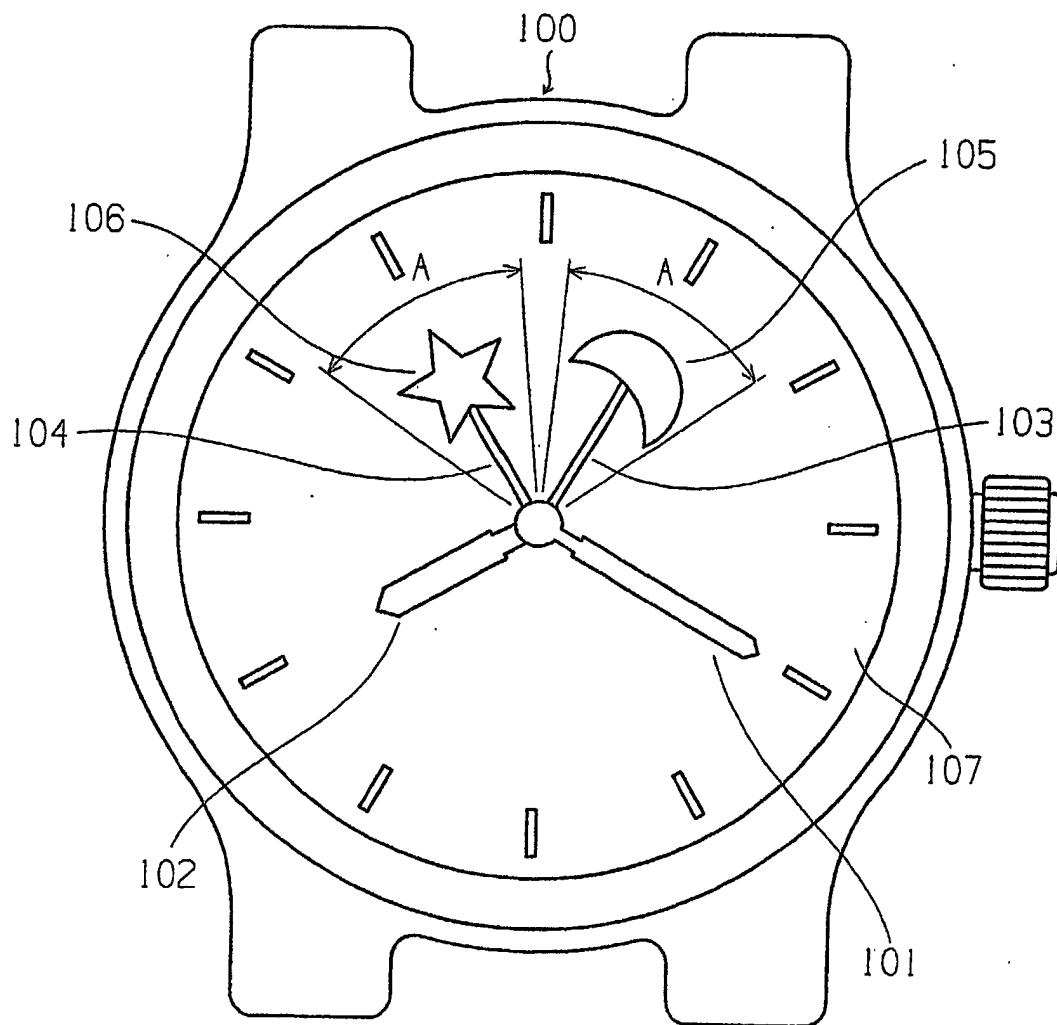


FIG. 2

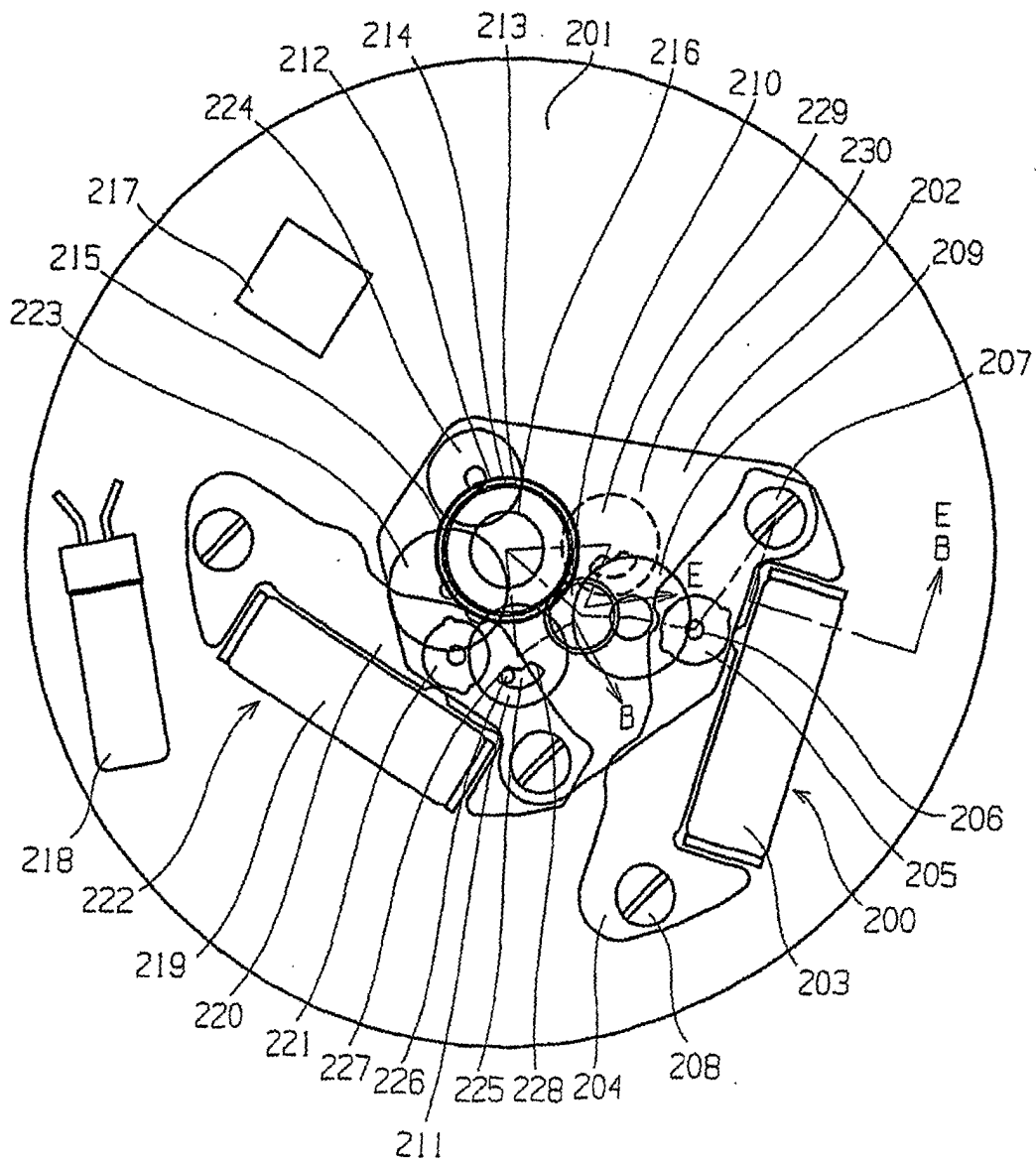
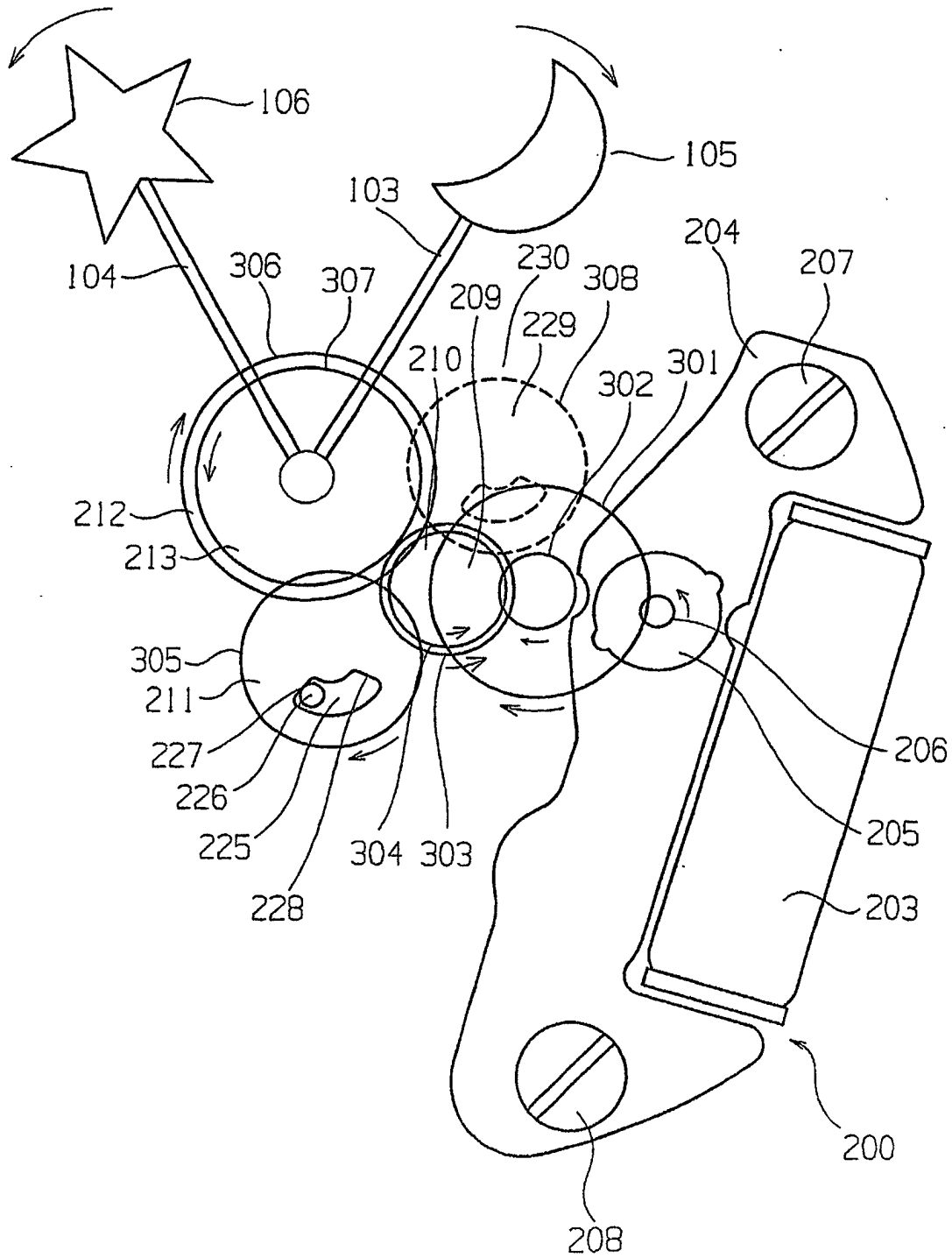


FIG. 3



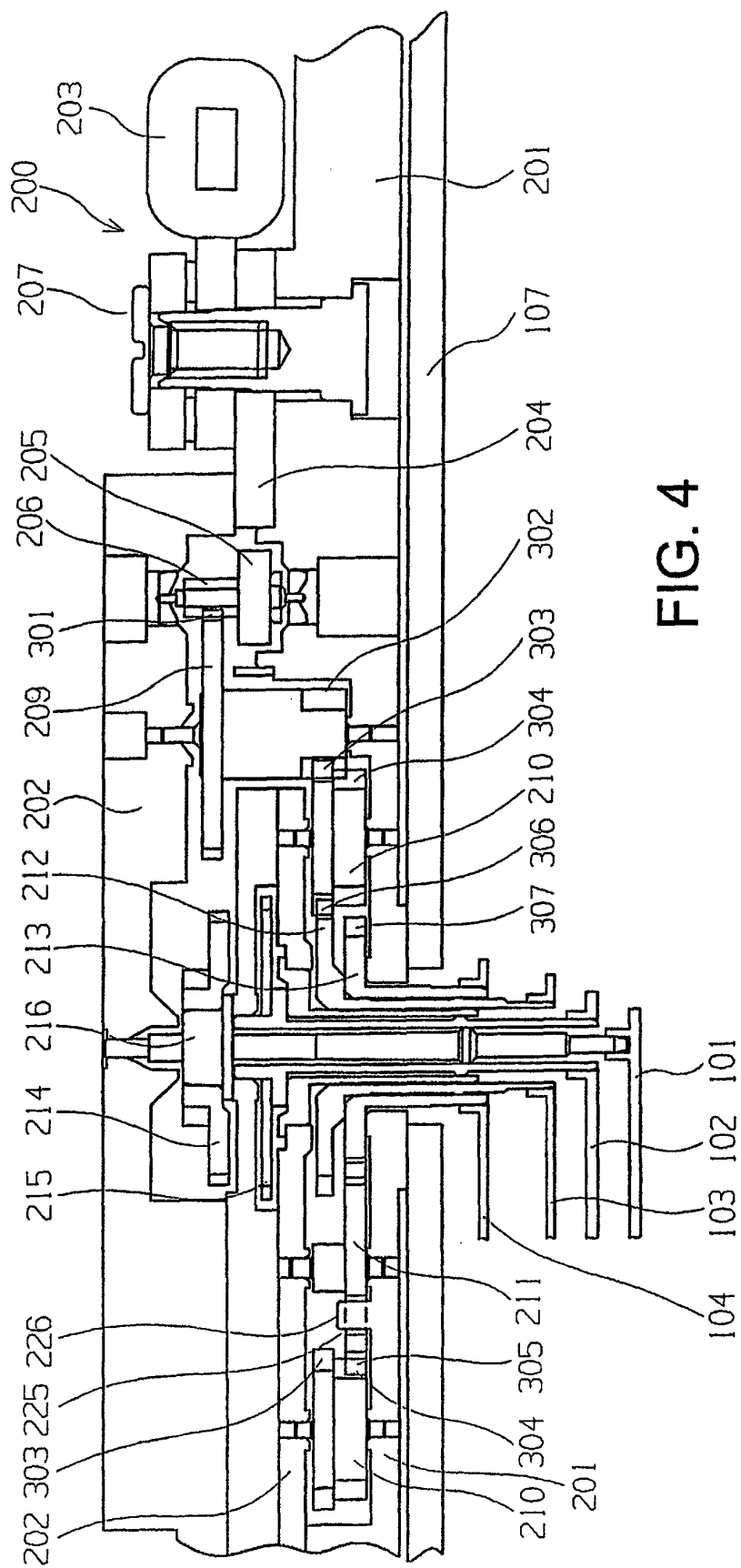


FIG. 4

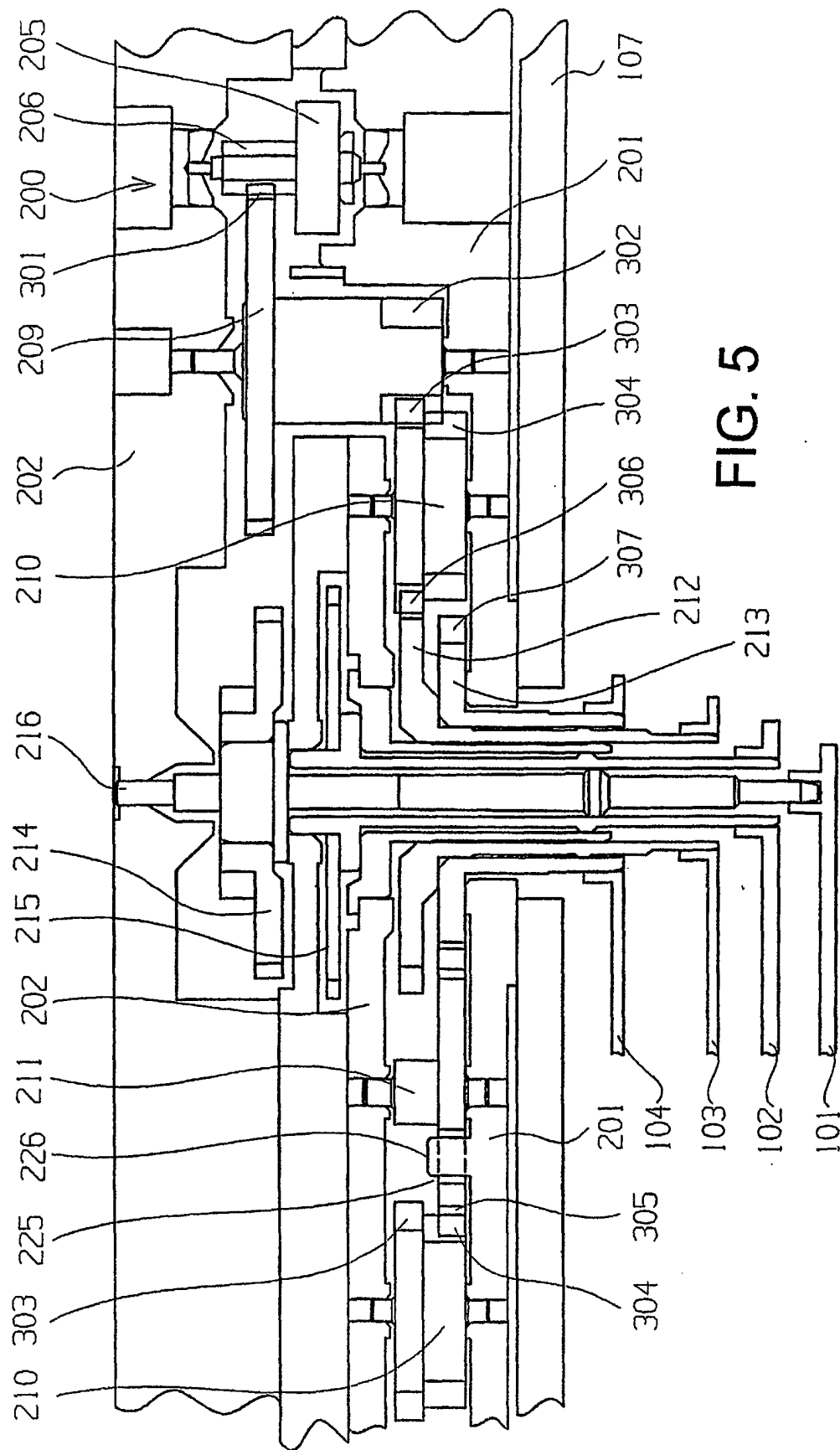


FIG. 5

FIG. 6

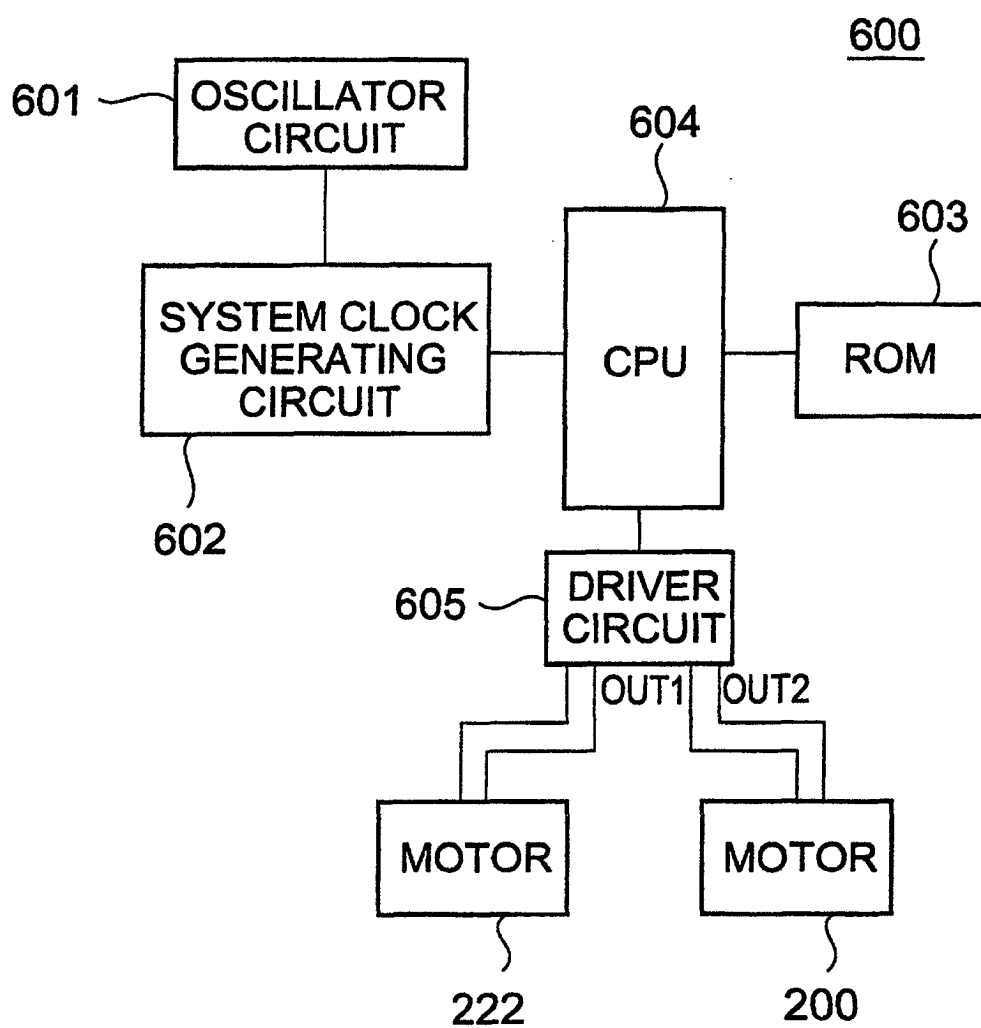


FIG. 7

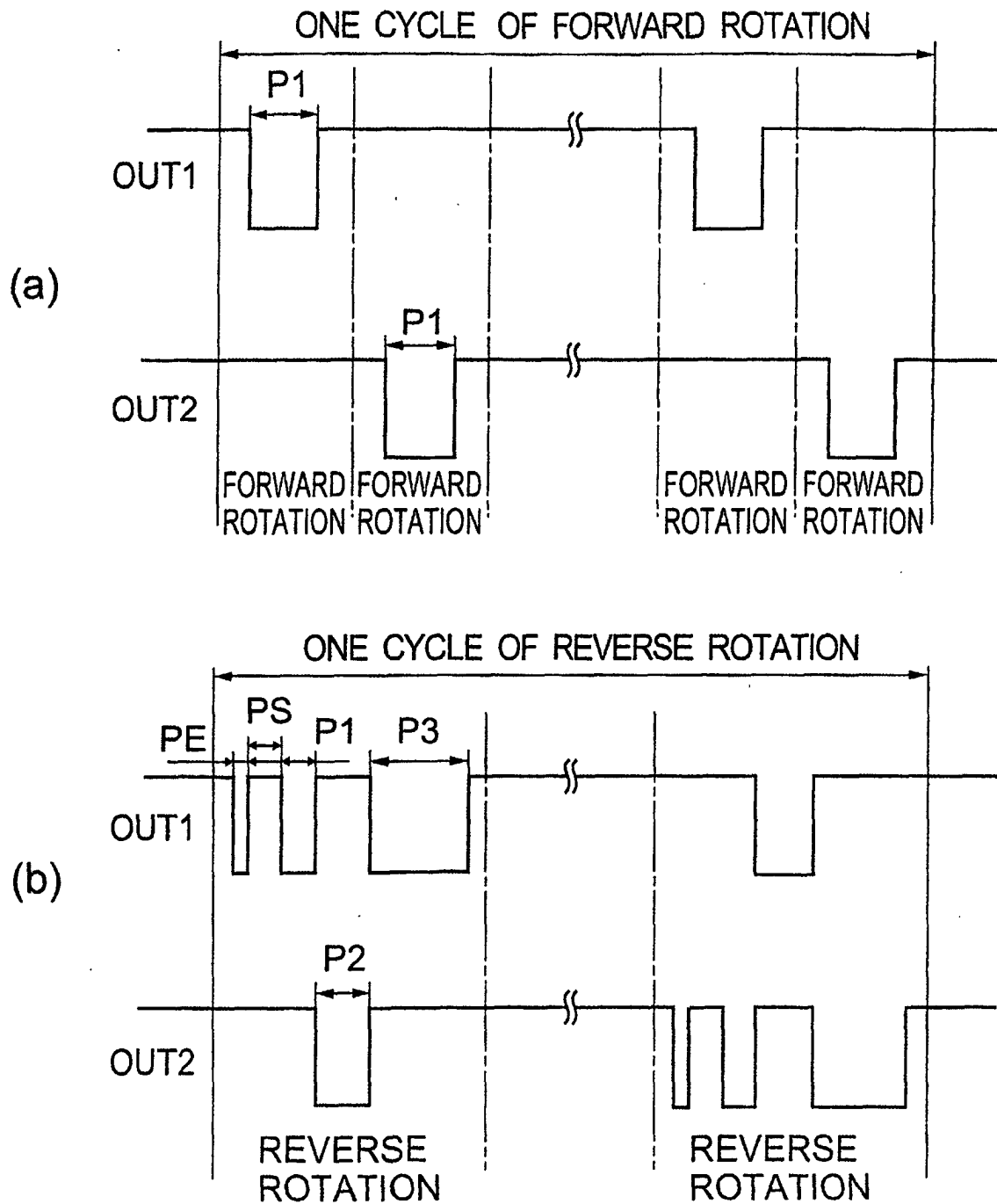


FIG. 8

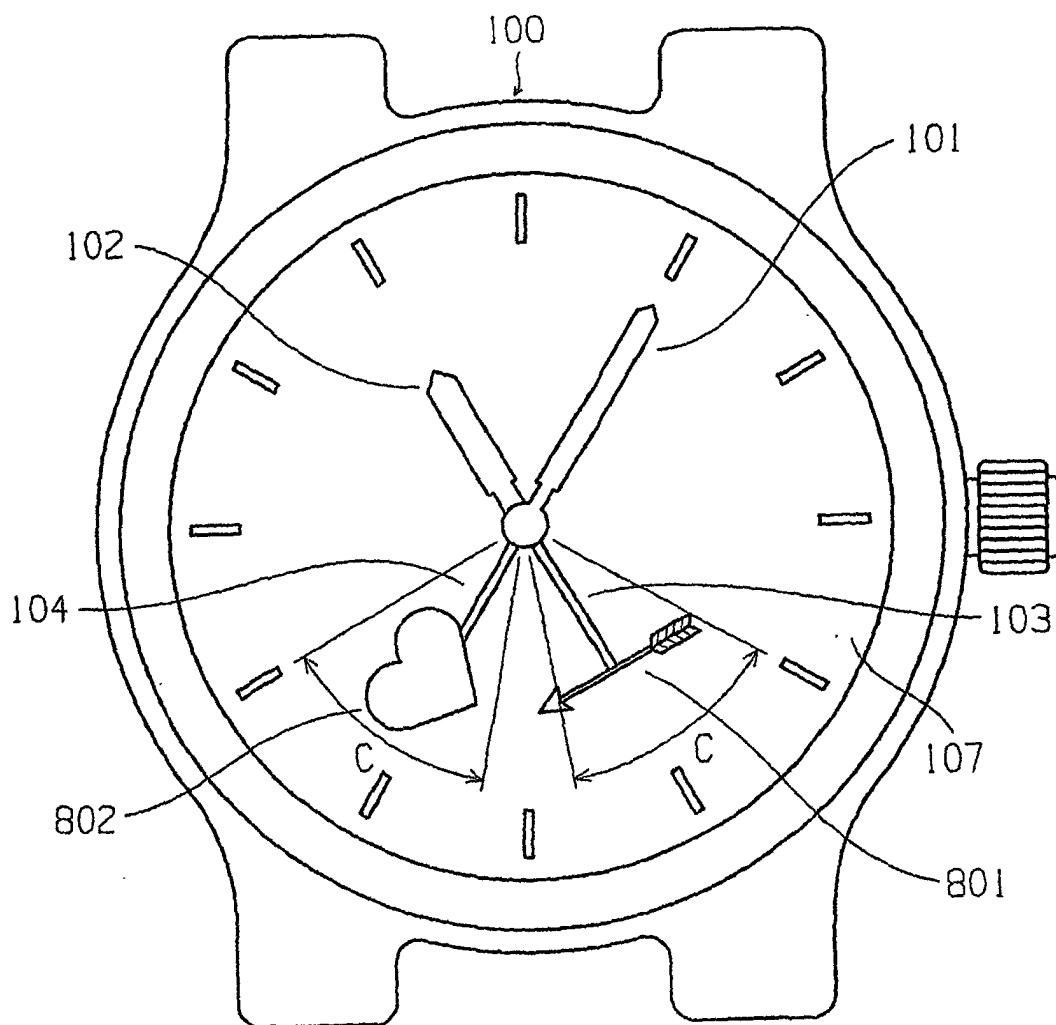
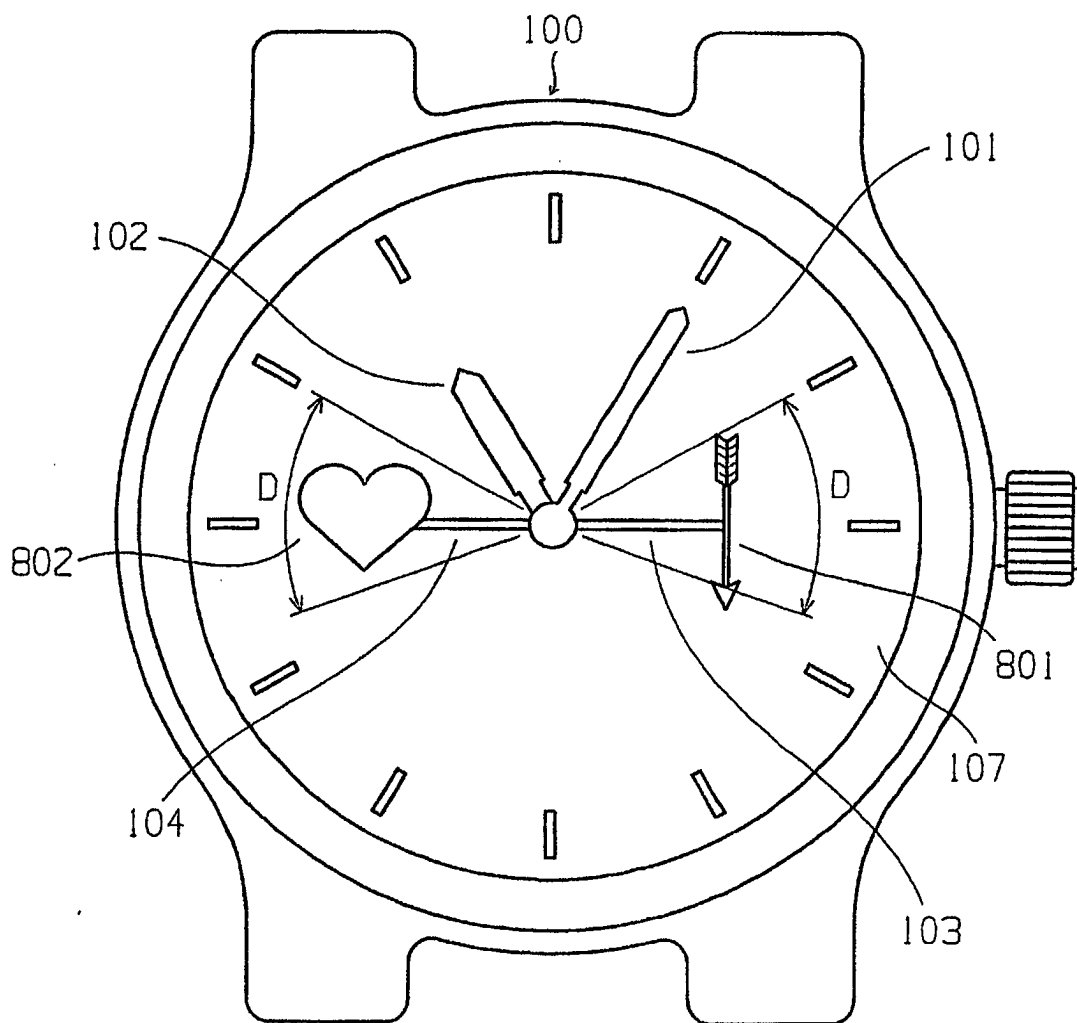


FIG. 9



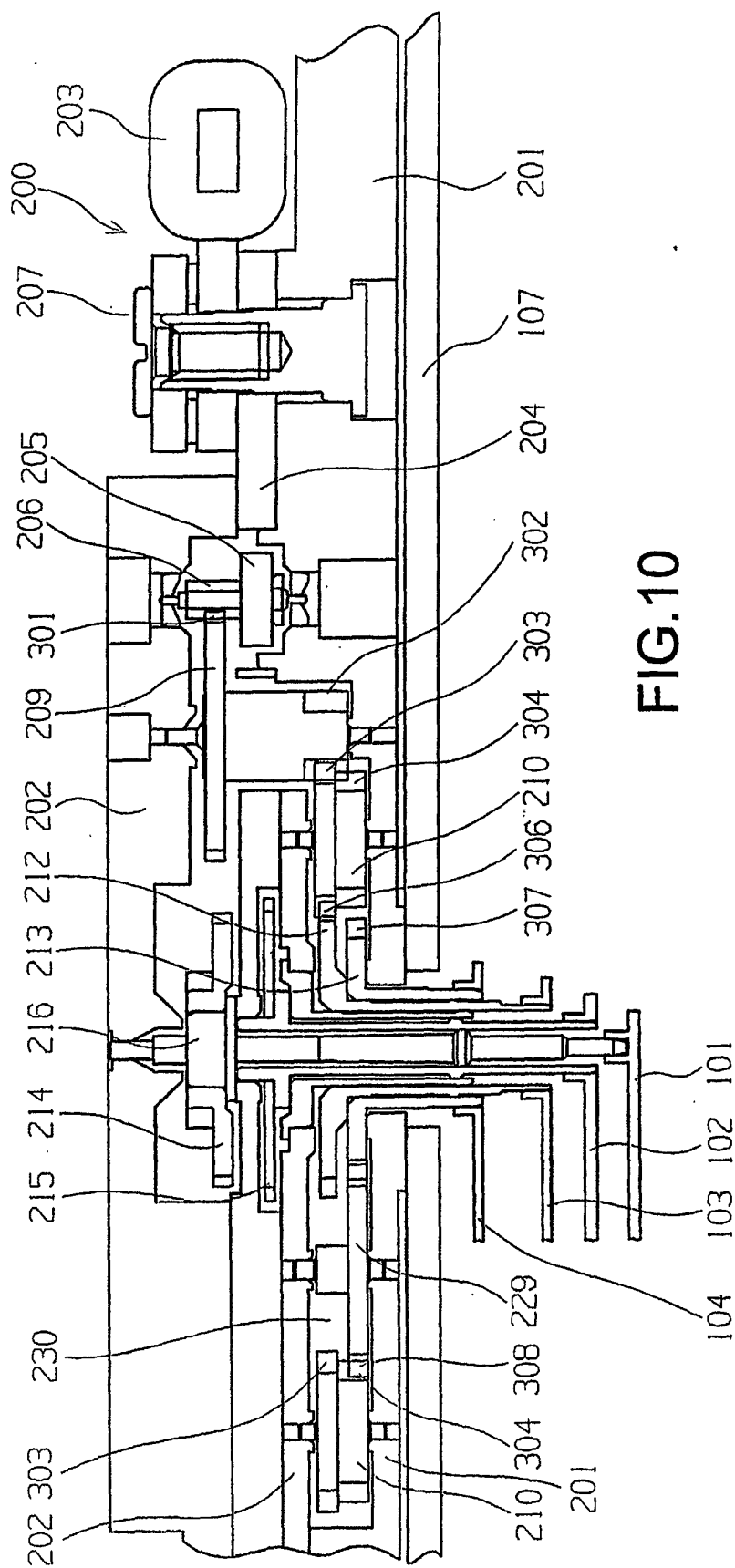


FIG. 10

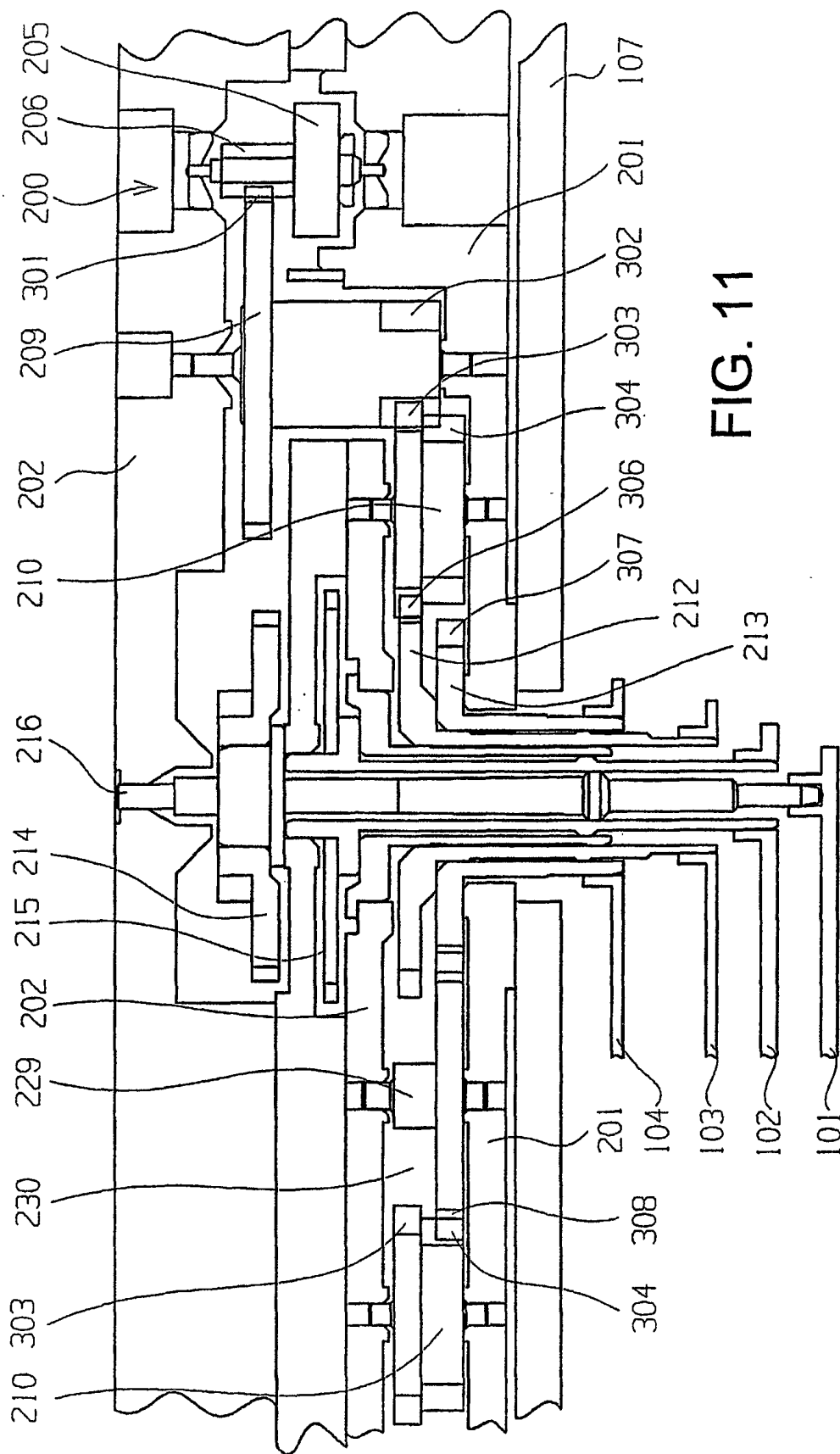


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP00/00327

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl ⁷ G04B19/00, G04B45/00, G04C3/00, G04C3/14		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl ⁷ G04B19/00, G04B45/00, G04C3/00, G04C3/14		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2000 Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 119754/1983 (Laid-open No.27389/1985), (Citizen Watch Co., Ltd.), 23 February, 1985 (23.02.85), Full text; all drawings (Family; none)	1-4
A	JP, 57-153294, A (Citizen Watch Co., Ltd.), 21 September, 1982 (21.09.82), Full text, all drawings (Family: none)	1-4
A	JP, 4-366788, A (Citizen Watch Co., Ltd.), 18 December, 1992 (18.12.92), Full text, all drawings (Family: none)	1-4
A	JP, 9-297185, A (Kotsubo K.K.), 18 November, 1997 (18.11.97), Full text, all drawings (Family: none)	1-4
A	GB, 8326155, A0 (CITIZEN WATCH CO., LTD), 02 November, 1983 (02.11.83),	1-4
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
Date of the actual completion of the international search 15 March, 2000 (15.03.00)		Date of mailing of the international search report 28 March, 2000 (28.03.00)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP00/00327

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Full text, all drawings & GB, 2128379, A & JP, 59-63585, A & US, 4474480, A1 & NO, 845154, A	
A	JP, 4-315987, A (Seiko Epson Corporation), 06 November, 1992 (06.11.92), Full text, all drawings (Family: none)	1~4
A	JP, 7-159550, A (Casio Computer Co, Ltd.), 23 June, 1995 (23.06.95), Full text, all drawings (Family: none)	1~4

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