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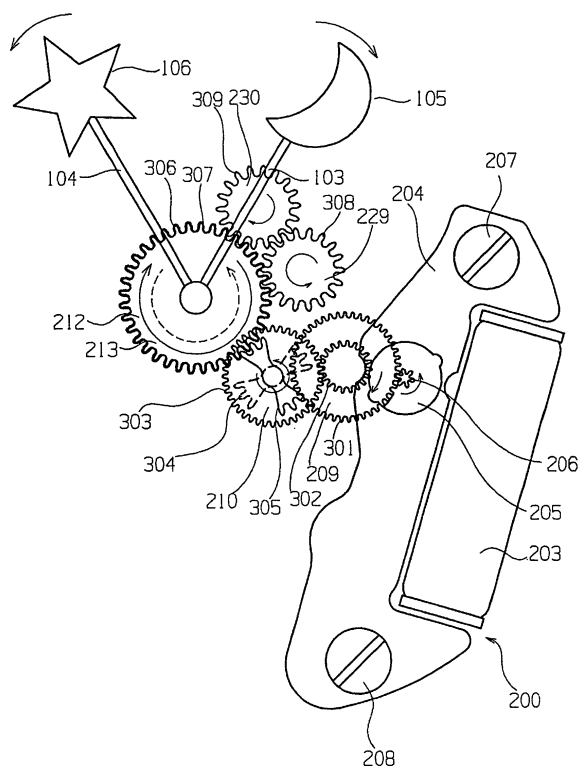
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(54) **ELECTRONIC TIMEPIECE WITH INDICATOR HANDS**

(57) An electronic timepiece (100) is provided that is provided with indicator hands capable of making a variety of indications by utilizing a mechanical drive mechanism, which comprises a time hand (101, 102) to indicate time, first and second indicator hands (104, 103) separately provided from the time hand (101, 102), a motor (200) for conveying rotation of the motor (200) in one direction, and a train wheel for conveying rotation of the motor (200) and reciprocally rotating the first and second indicator hands (104, 103) in opposite directions to each other within a predetermined range. The train wheel conveys rotation of the motor (200) and reciprocally rotates the first and second indicator hands (104, 103) in directions opposite to each other within the predetermined range.

Fig. 3



Description

TECHNICAL FIELDS

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

[0003] In the conventional electronic timepieces with indicator hands, the hand having a function as an indicator hand is structured by a needle-like second hand or disk-formed second hand, wherein the second hand serves also as the indicator hand. Also, in a conventional electronic timepiece having an indicator hand to be operated only by operation of the user, the indicator hand served also as a time hand indicative of time or the indicator hand operates interacting with the time hand.

[0004] Consequently, in any of the above electronic timepieces, there was nothing more than having one indicator hand serving also for time indication. With one indicator hand, it was impossible to provide the figure such as a character with a variety of movements and a variety of indications.

[0005] Meanwhile, despite there has existed the electronic timepieces having an indicator hand moving at all times, they have been nothing more than providing a figure or the like on a disk-formed second hand or needle-like second hand and could not have made a variety of indications, such as providing a variety of movements.

[0006] Meanwhile, where the indicator hand serves also as a time hand or interacts with the time hand, the figure or the like to be integrally formed on the indicator hand is restricted in size making it difficult to use an indicator hand capable of a variety of indications.

[0007] It is an object of the present invention to provide an electronic timepiece with indicator hands capable of making a variety of indications by utilizing a mechanical drive mechanism.

DISCLOSURE OF THE INVENTION

[0008] The present invention adopts a technical structure as described below in order to achieve the above object.

[0009] That is, an electronic timepiece with indicator hands of the present invention is characterized by comprising a time hand to indicate time, first and second indicator hands separately provided from the time hand, a motor for conveying rotation of the motor in one direction, and a train wheel for conveying rotation of the motor and reciprocally rotating the first and second indicator

hands in opposite directions to each other within a predetermined range. The train wheel receives one-directional rotation of the motor to reciprocally rotate the first and second indicator hands within the predetermined range.

[0010] Here, the train wheel may be structured to have a first wheel to rotatively drive the first indicator hand, a second wheel to rotatively drive the second indicator hand, first and second pinions each formed in part of an circular periphery and meshing alternately with first wheel and the second wheel, and has a third wheel to rotate responsive to rotation of the motor and a wheel for reverse rotation, wherein, when the first pinion meshes with the first wheel, rotation of the first pinion is conveyed through the wheel for reverse rotation to the second wheel, and when the second pinion meshes with the second wheel, rotation of the second pinion being conveyed through the wheel for reverse rotation to the first wheel.

[0011] Also, the third wheel may be structured to have the first and second pinion and a gear to receive rotation of the motor to be conveyed to the gear and rotate, the second pinion being out of mesh with the second wheel when the first pinion is in mesh with the first wheel, and the first pinion is out of mesh with the first wheel when the second pinion is in mesh with the second wheel.

[0012] Furthermore, the first and second pinions may be structured with a same number of teeth.

[0013] Also, the time hand and the indicator hands may be arranged on a same shaft.

[0014] Incidentally, the electronic timepiece is an electronic wristwatch.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a front view showing an external appearance of one concrete example of an electronic timepiece with indicator hands according to the present invention.

Fig. 2 is a rear view of a drive mechanism used in the one concrete example of the electronic timepiece with indicator hands according to the invention.

Fig. 3 is a magnified rear view of the drive mechanism used in the one concrete example of the electronic timepiece with indicator hands according to the invention.

Fig. 4 is a B-B sectional view in Fig. 2.

Fig. 5 is a fragmentary magnified sectional view of Fig. 4.

Fig. 6 is a front view showing an external appearance of another concrete example of an electronic timepiece with indicator hands according to the invention.

Fig. 7 is a front view showing an external appearance of another concrete example of an electronic

timepiece with indicator hands according to the invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0016] Hereunder, concrete examples of electronic timepieces with indicator hands according to the present invention will be explained in detail with reference to the drawings.

[0017] Fig. 1 is a front view of showing an external appearance of a concrete example of an electronic timepiece with indicator hands according to the invention, showing an example of an electronic wristwatch. In Fig. 1, an electronic wristwatch 100 has time hands comprising a minute hand 101 and hour hand 102 to indicate time, and is provided with a first indicator hand 104 integrally formed with a star-shaped figure 106, a second indicator hand 103 integrally formed with a crescent-shaped figure 105, an dial 107 and an operation switch 108 for generating music. The indicator hands 103, 104 are arranged between the minute hand 101 and hour hand 102 and the dial 107.

[0018] As described later, two systems of train wheels are used having one motor as a drive source different from a motor for driving the time hands 101, 102 and conveying oppositely reverse rotation to the indicator hands 103, 104 at a reduction ratios corresponding to a second hand, thereby rotatively driving the indicator hands 103, 104 in pair in a manner reciprocally moving them in opposite directions to each other at a same rate and within a predetermined range of angle A.

[0019] Fig. 2 is a backside view showing a drive mechanism of the electronic wristwatch 100 with indicator hands shown in Fig. 1, Fig. 3 is a magnified backside view showing the drive mechanism of the electronic wristwatch 100 with indicator hands shown in Fig. 1, Fig. 4 is a B-B sectional view in Fig. 2, and Fig. 5 is a fragmentary magnified sectional view of Fig. 4, wherein the same parts are denoted by the same reference numerals.

[0020] In Fig. 2 to Fig. 5, between a main plate 201 and a support plate 202 are accommodated time hands comprising the minute hand 101 and the hour hand 102, a drive mechanism for rotatively driving the pair of indicator hands 103, 104 and an electronic circuit. Specifically, the structure is provided as follows.

[0021] A first stepping motor 200, structured by a coil 203, a stator 204 and a rotor magnet 205, rotates only in one direction. The stator 204 and the coil 203 are fixed on the main plate 201 through screws 207, 208.

[0022] A pinion 206 of the rotor magnet 205 is in mesh with a gear 301 of a wheel 209. A pinion 302 of the wheel 209 is in mesh with a gear 303 of a wheel 210 as a third wheel. A wheel 210 has a same number of teeth of a first pinion 304 and a second pinion 305 that are each formed in part of the circumference and arranged at upper and lower sandwiching the gear 303. That is, the wheel 210 is in a three-stage structure of the gear 301

and the pinions 304, 305.

[0023] The pinions 304, 305 each alternately are structured to mesh with an hour wheel 213 as a first wheel and an hour wheel 212 as a second wheel. That is, when the pinion 304 meshes with the gear 307 of the hour wheel 213, the pinion 305 does not mesh with the gear 306. When the pinion 304 becomes out of mesh with the gear 307, the pinion 305 meshes with the gear 306. Also, when the pinion 305 becomes out of mesh with the gear 306, the pinion 304 structurally meshes with the gear 307.

[0024] The hour wheel 213 is for rotatively driving the indicator hand 104, and integrally formed with the indicator hand 104. The hour wheel 212 is for rotatively driving the indicator hand 103, and integrally formed with the indicator hand 103.

[0025] On the other hand, between the hour wheel 212 and the hour wheel 213 are arranged in mesh a same shape of a fourth wheel 230 and a fifth wheel 229 that are structured such that the hour wheels 212, 213 rotate at a same speed but in opposite directions. Due to this, the indicator hand 103 and the indicator hand 104 are structured to be rotatively driven at a same speed but in reverse directions to each other. Accordingly, the crescent-shaped figure 105 integrally formed on the indicator hand 103 and the star-shaped figure 106 integrally formed on the indicator hand 104 are rotatively driven at a same speed but in opposite directions to each other.

[0026] Incidentally, the wheel 210, the hour wheels 212, 213, the wheels 229, 230 constitute a train wheel to convey rotation of the motor 200 and reciprocally rotate the first and second indicator hands 104, 103 each in reverse directions and in a predetermined range.

[0027] On the other hand, the wristwatch 100 is provided with a structure to rotatively drive the minute hand 101 and the hour hand 102. That is, provided are a second stepping motor 222 structured by a coil 219, a stator 220 and a rotor magnet 221 as well as a third train wheel structured by a wheel 214 to rotatively drive the wheels 223, 224 for conveying rotation of the rotor magnet 221 and the minute wheel 101, and an hour wheel 215 to rotatively drive the hour wheel 102.

[0028] The hour wheels 212, 213, 215 are concentrically arranged on a shaft 216 integrally formed with the wheel 214. Due to this, the minute hand 101, the hour hand 102 and the indicator hands 103, 104 are arranged on the same shaft. Consequently, because of unnecessary of an exclusive space for mounting the indicator hand 103, 104, size reduction is feasible and united feeling with the design on the dial 107 is possible to provide with.

[0029] Meanwhile, an integrated circuit 217 is incorporated that incorporates a quartz oscillator 218 constituting an oscillator circuit and a drive circuit.

[0030] Hereunder, the operation of the present concrete example will be explained in detail using Fig. 1 to Fig. 5.

[0031] In Fig. 3, when the rotor magnet 205 of the stepping motor 200 rotate in one direction (arrow direction) and the pinion 206 rotates in the arrow direction, the wheel 209 whose gear 301 is in mesh with the pinion 206 rotates in the arrow direction. The wheel 210 whose gear 303 is in mesh with the pinion 302 of the wheel 209 rotates in the arrow direction, and the pinion 305 rotates in a state that the pinion 305 meshes with the gear 306 of the hour wheel 212. Due to this, the hour wheel 212 rotates in the solid-lined arrow direction and the indicator hand 103 rotates in the arrow direction.

[0032] Simultaneously, the wheel 229 whose gear 308 is in mesh with the gear 306 of the hour wheel 212 rotates in the arrow direction, and the wheel 230 whose gear 309 is in mesh with the gear 308 rotates in the arrow direction. Due to this, the hour wheel 213 whose gear 307 is in mesh with the gear 309 rotates in the broken-lined arrow that is opposite in direction to the hour wheel 212, and the indicator hand 104 rotates in the arrow direction.

[0033] The above operation is made while the pinion 305 is in mesh with the gear 306. Due to this, the crescent-shaped figure integral 105 with the indicator hand 103 rotates a predetermined angle in the arrow direction, and the star-shaped figure 106 integral with the indicator hand 104 rotates a same angle at a same speed as the crescent-shaped figure 105.

[0034] Next, the wheel 210 rotates in the arrow direction from the state of Fig. 3, and the pinion 305 leaves from the gear 306 and simultaneously the pinion 304 meshes with the gear 307 of the hour wheel 213 and, in this state, rotates in the arrow direction. Due to this, the hour wheel 213 rotates in the solid-lined arrow direction, and the indicator hand 104 rotates in the anti-arrow direction.

[0035] At the same time, the wheel 230 whose gear 309 is in mesh with the gear 307 of the hour wheel 213 rotates in the anti-arrow direction, and the wheel 229 whose gear 308 is in mesh with the gear 309 rotates in the anti-arrow direction. Due to this, the hour wheel 212 whose gear 306 is in mesh with the gear 308 rotates in the broken-lined arrow direction, and the indicator hand 103 rotates in the anti-arrow direction.

[0036] The above operation is made while the pinion 304 is in mesh with the gear 307. Due to this, the crescent-shaped figure 105 integral with the indicator hand 103 rotates a predetermined angle in the arrow direction, and the star-shaped figure 106 integral with the indicator hand 104 rotates a same angle at a same speed as the crescent-shaped figure 105.

[0037] Next, the wheel 210 further rotates and the pinion 304 rotates and leaves from the gear 307, and simultaneously the pinion 305 rotates in the arrow direction in the state meshing with the gear 306 of the hour wheel 212.

[0038] Thereafter, the above operation is repeated thereby enabling the crescent-shaped figure 105 integral with the indicator hand 103 and the star-shaped figure

106 integral with the indicator hand 104 to reciprocally rotatively move in directions opposite to each other and at a same speed within a predetermined angle range.

[0039] Fig. 6 is a front view showing an external appearance of another concrete example of an electronic timepiece with indicator hands according to the invention.

[0040] In Fig. 6, an electronic wristwatch 100 has time hands comprising a minute hand 101 and an hour hand 102, and a first indicator hand 103 integrally formed with an arrow-shaped figure 801 and a second indicator hand 104 integrally formed with a heart-shaped figure 802. The indicator hands 103, 104 are arranged between the minute hand 101 and hour hand 102 and the dial 107. The pair of indicator hands 103, 104 are each rotatively driven to reciprocally move in directions opposite to each other at a same speed within a predetermined angular range C.

[0041] Fig. 7 is a front view showing an external appearance of another concrete example of an electronic timepiece with indicator hands according to the invention, wherein the same parts as in Fig. 1 and Fig 6 are denoted by the same reference characters.

[0042] In Fig. 7, an electronic wristwatch 100 has time hands comprising a minute hand 101 and an hour hand 102, and a first indicator hand 103 integrally formed with an arrow-shaped figure 801 and a second indicator hand 104 integrally formed with a heart-shaped figure 802. The indicator hands 103, 104 are arranged between the minute hand 101 and hour hand 102 and the dial 107. The pair of indicator hands 103, 104 are each rotatively driven to reciprocally move in directions opposite to each other at a same speed within a predetermined angular range D.

[0043] As shown in Fig. 1, Fig. 6 and Fig. 7, various forms of representation can be provided by changing the figures attached to the indicator hands 103, 104 to various figures such as characters or letters, or the attaching angle of the indicator hands 103, 104 or the rotation angular range of the indicator hands 103, 104.

[0044] As described above, the electronic timepiece with indicator hands according the concrete examples of the invention is characterized by comprising time hands 101, 102 to indicate time, first and second indicator hands 104, 103 separately provided from the time hands 101, 102, a motor 200 rotating in one direction, and a train wheel (wheels 210, 229, 230, hour wheels 212, 213) to convey rotation of the motor 200 and reciprocally rotate the first and second indicator hands 104, 103 each in opposite directions within a predetermined range.

[0045] Therefore, an electronic wristwatch 100 with indicator hands can be provided that is provided with indicator hands 103, 104 capable of providing a variety of representations.

[0046] Also, to drive the indicator hands 103, 104 is realized with one motor. Because there is no need of

using a plurality of motors, structuring is feasible at low cost. Also, where realized using a forward-reverse rotating motor in place of the motor 200, problems occur with high consumption power, low produced torque and as a result a short battery life in the electronic timepiece. However, the present concrete example does not pose such problems because of use of a motor rotating in one direction.

[0047] Also, it becomes possible to indicate such movement as desirably moving within a certain predetermined range, such indication as cannot be represented only rotation in one single direction, e.g., integrally forming character's both hands or both legs on the two indicator hands 103, 104.

[0048] Also, where figures of both hands are formed integrally on the indicator hands 103, 104, it is possible to represent such motions as reciprocally moving pit-a-pat the both hands within a predetermined range of movement or widely waving the hand of the character by variously setting the attachment angle of the indicator hands 103, 104 or displaying to clap the hands.

[0049] Furthermore, because the indicator hands 103, 104 are being reciprocally moved at all times, where for example exhibited at a point of sale, differentiation from other timepieces is possible to achieve.

[0050] Furthermore, by arranging the indicator hands 103, 104 between the hour hand and the dial, it is possible to provide a united feel with the design on the dial 107.

[0051] Incidentally, in the above concrete examples, although the indicator hands 103, 104 were made to rotate at a same speed, they may be rotated at different speeds from each other by changing the reduction ratio of the train wheel.

[0052] Also, in the above concrete examples, the indicator hands 103, 104 were made same in rotation range, it may be made different.

[0053] Furthermore, in the above concrete examples, the time hands were structured by the minute hand 101 and the hour hand 102, a second hand may be added thereto.

INDUSTRIAL APPLICABILITY

[0054] As above, the electronic timepiece according to the present invention is applicable to various electronic timepieces ranging from electronic wristwatches to wall electronic timepieces and desk electronic timepieces.

Claims

1. An electronic timepiece with indicator hands, **characterized by** comprising: a time hand (101, 102) to indicate time, first and second indicator hands (104, 103) separately provided from said time hand (101, 102), a motor (200) for conveying rotation of said

motor (200) in one direction, and a train wheel for conveying rotation of said motor (200) and reciprocally rotating said first and second indicator hands (104, 103) in opposite directions to each other within a predetermined range.

2. An electronic timepiece with indicator hands as claimed in claim 1, **characterized in that** said train wheel has a first wheel (213) to rotatively drive said first indicator hand (104), a second wheel (212) to rotatively drive said second indicator hand (103), first and second pinions (304, 305) each formed in part of an circular periphery and meshing alternately with first wheel (213) and said second wheel (212), and has a third wheel (210) to rotate responsive to rotation of said motor (200) and a wheel for reverse rotation (229, 230),

wherein, when said first pinion (304) meshes with said first wheel (213), rotation of said first pinion (304) is conveyed through said wheel for reverse rotation (229, 230) to said second wheel (212), and

when said second pinion (305) meshes with said second wheel (212), rotation of said second pinion (305) being conveyed through said wheel for reverse rotation (229, 230) to said first wheel (213).

3. An electronic timepiece with indicator hands as claimed in claim 2, **characterized in that** said third wheel (210) structurally has said first and second pinion (304, 305) and a gear (303) to receive rotation of said motor (200) to be conveyed to said gear (303) and rotate, said second pinion (305) being out of mesh with said second wheel (212) when said first pinion (304) is in mesh with said first wheel (213), and said first pinion (304) is out of mesh with said first wheel (213) when said second pinion (305) is in mesh with said second wheel (212).

4. An electronic timepiece with indicator hands as claimed in claim 3, **characterized in that** said first and second pinions (304, 305) are structured with a same number of teeth.

5. An electronic timepiece with indicator hands as claimed in claim 4, **characterized in that** said time hand (101, 102) and said indicator hands (103, 104) are arranged on a same shaft.

6. An electronic timepiece with indicator hands as claimed in any one of claim 1 to claim 5, **characterized in that** said electronic timepiece is an electronic wristwatch (100).

Fig. 1

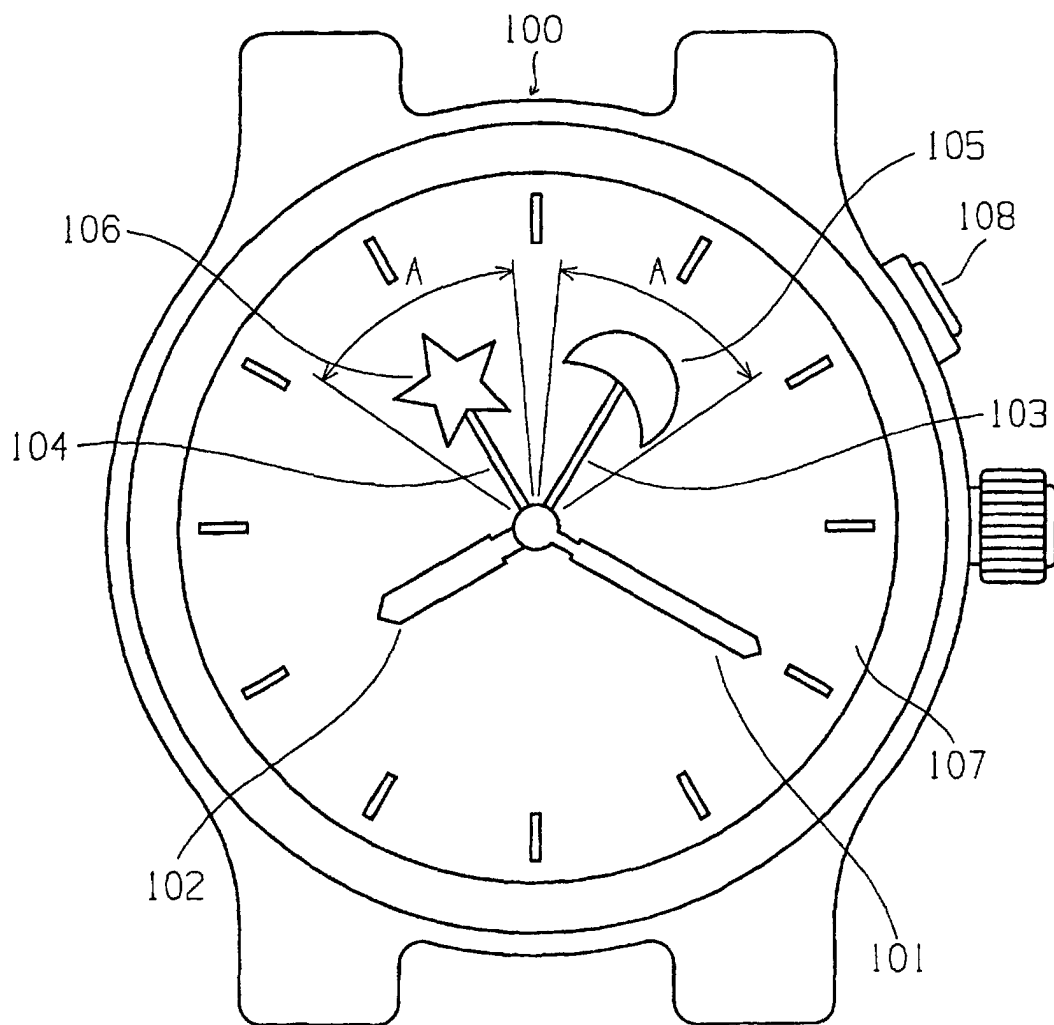


Fig. 2

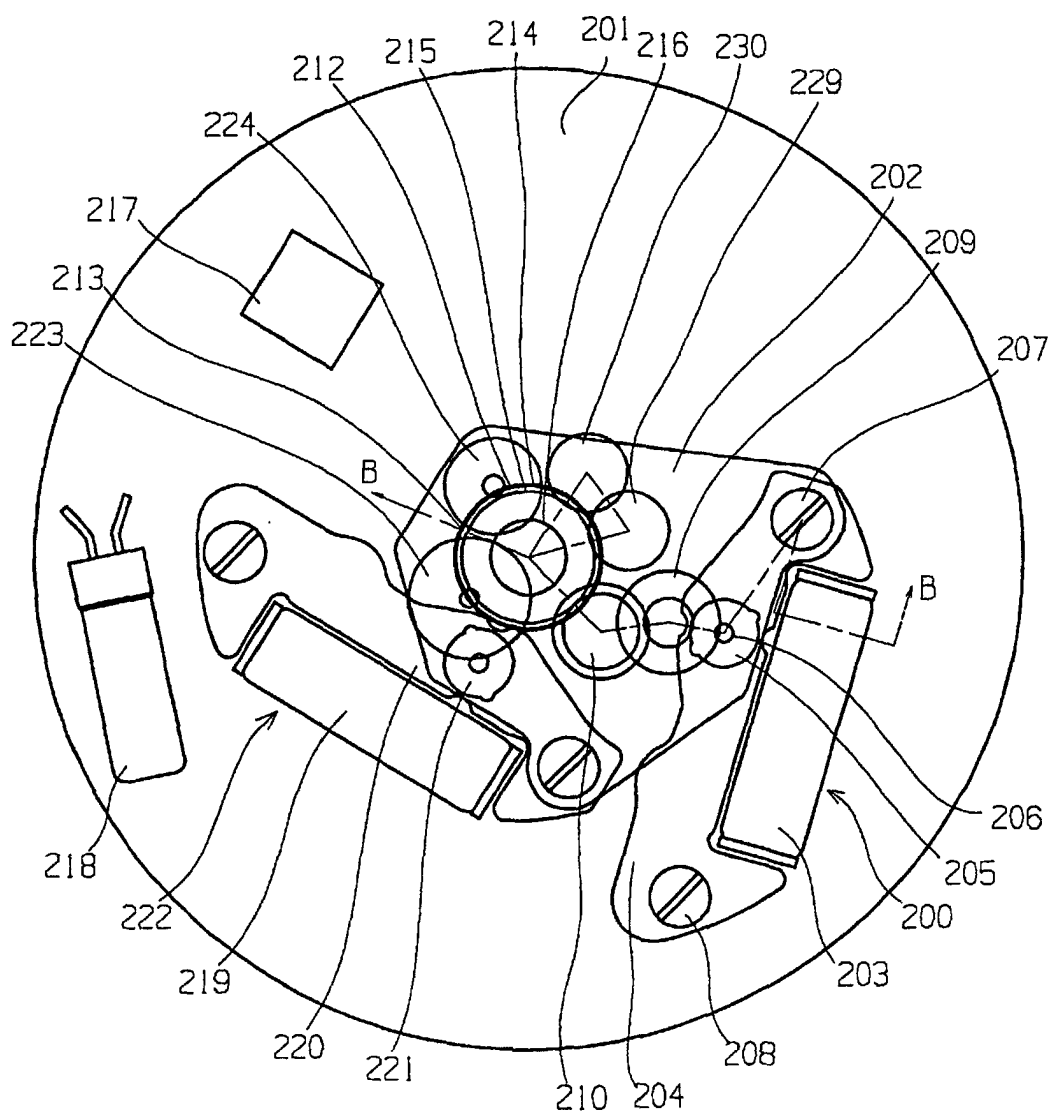
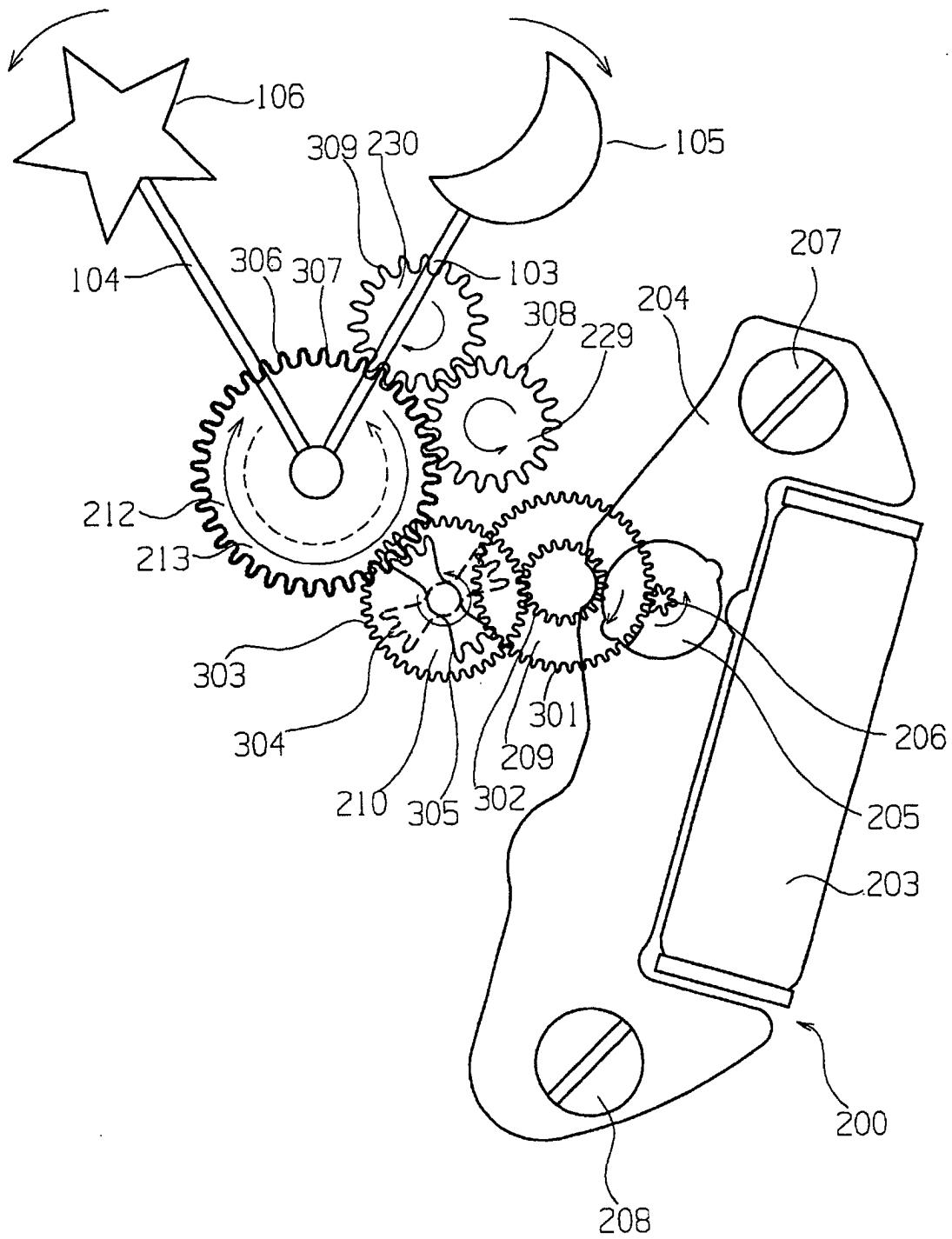
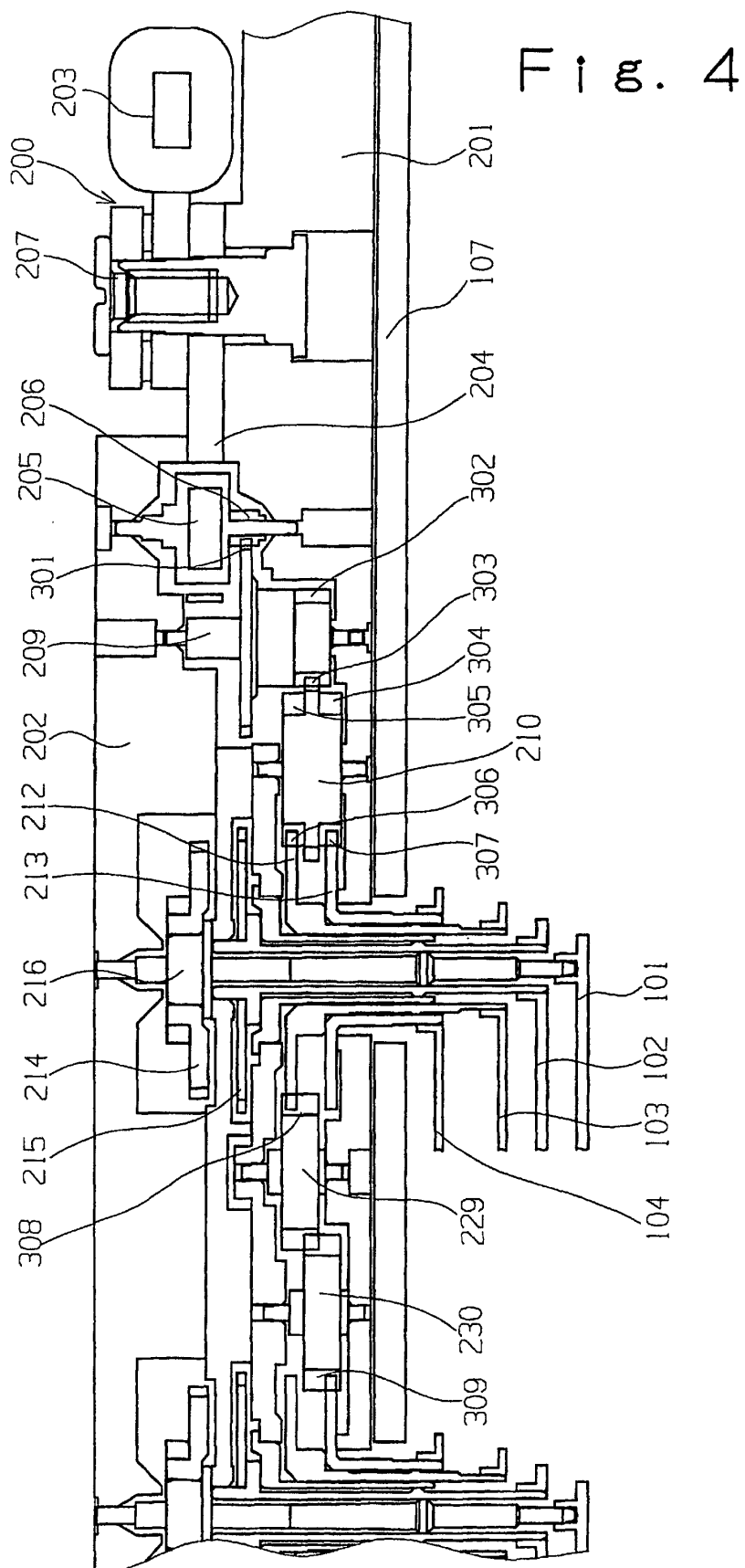


Fig. 3





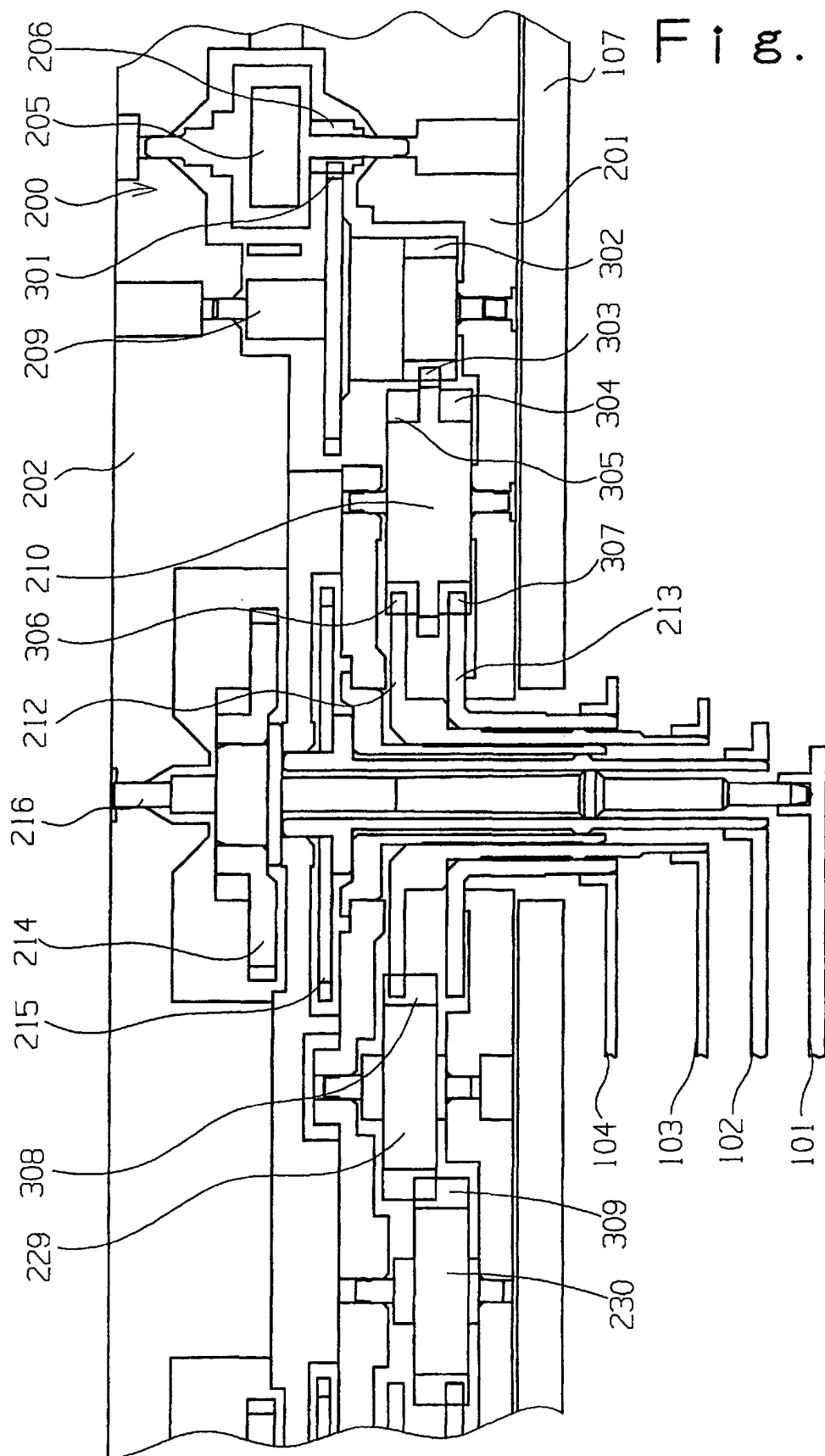


Fig. 5

Fig. 6

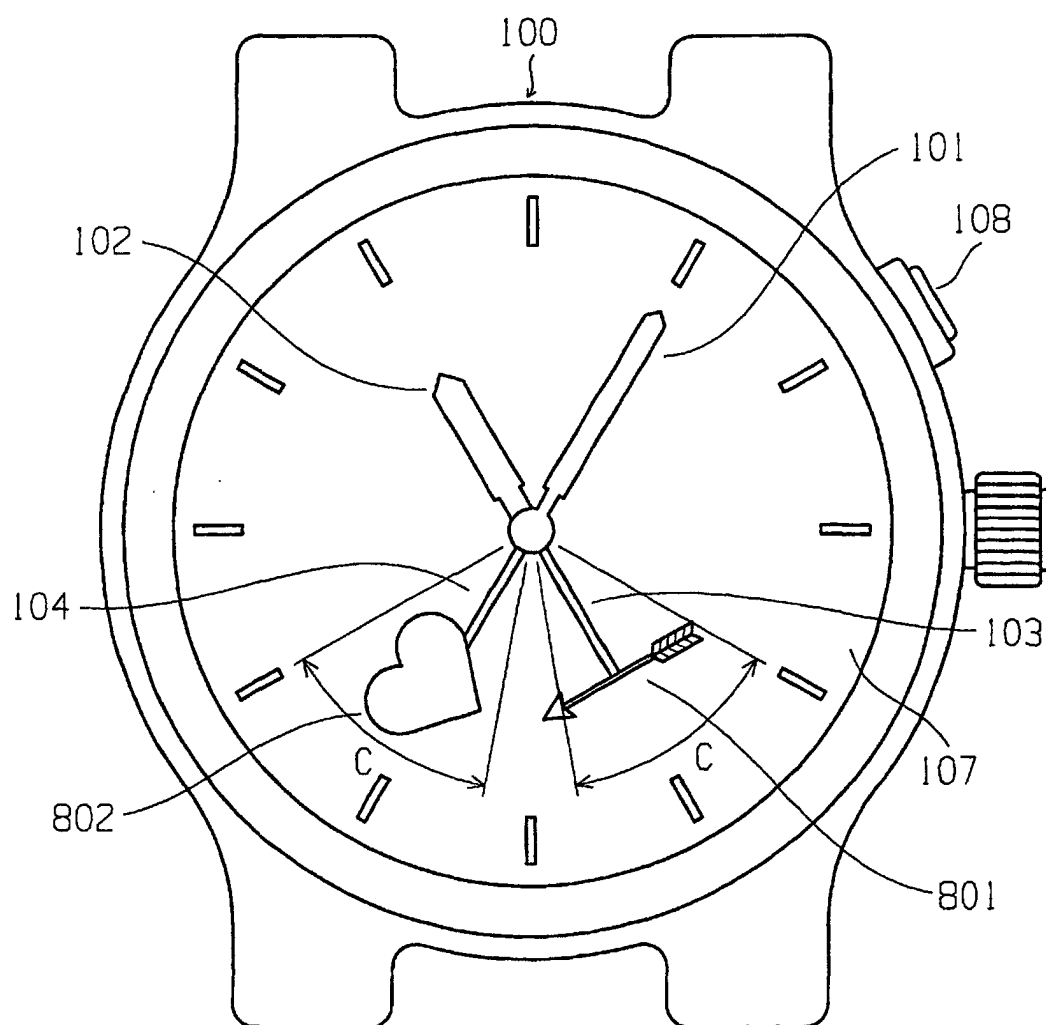
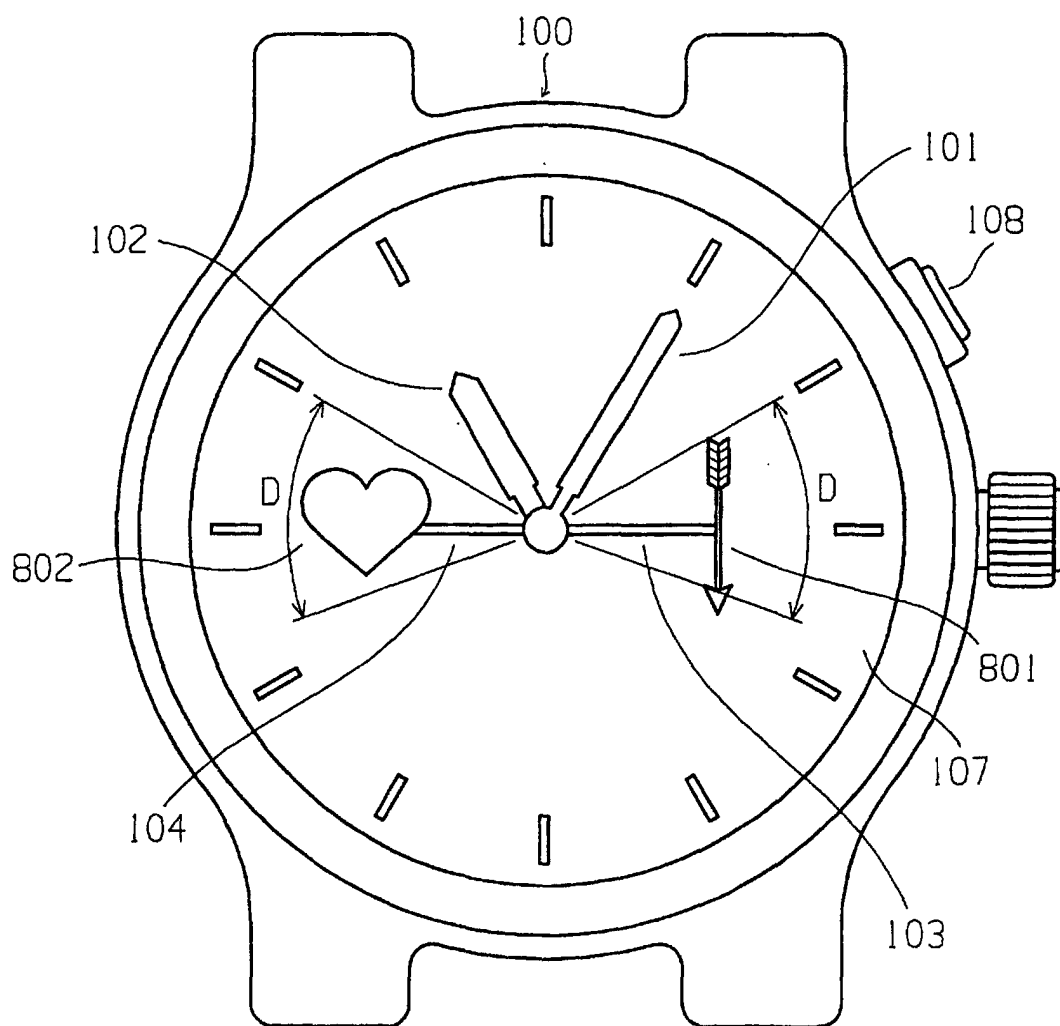


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP00/02247

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl ⁷ G04C3/00, G04C3/14, G04B45/00, G04B19/02		
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, 19/02, 45/00, G04C3/00, 3/14, G09F19/02, A63H		
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.160777/1983 (Laid-open No.68491/1985), (Tsutomu FUJIMURA), 15 May, 1985 (15.05.85), Full text; all drawings (Family: none)	1-6
A	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No.95816/1991 (Laid-open No.38592/1993) (Kabushiki Kaisha Santeru), 25 May, 1993 (25.05.93), Full text; all drawings (Family: none)	1-6
<input 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 30 June, 2000 (30.06.00)		Date of mailing of the international search report 18 July, 2000 (18.07.00)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)