

ELECTRICITY FEEDING MECHANISM AND ELECTRONIC TIMEPIECE HAVING THE SAME

BACKGROUND OF THE INVENTION

Field of the Invention:

The present invention relates to an electricity feeding mechanism and an electronic timepiece having the same.

Description of the Prior Art:

In an electronic timepiece, it is known that other end of a battery contact terminal one end of which is brought into contact with an electric pole of a battery is extended to a circuit board having an IC (integrated circuit) to thereby directly feed electricity from the battery to the IC (JP-A-7-169451).

However, in a case of an electronic timepiece of an analog type, when a train wheel for the timepiece is arranged predominantly at a center portion in a case and a winding stem is projected from a side wall of the case to adapt to a display by a time display hand, since a quartz oscillator, a motor and a battery are constituted by parts having large sizes similar to the train wheel for the timepiece, the motor and the quartz oscillator are arranged along an outer periphery of the case by interposing a circuit board, and the battery is arranged at a vicinity of the outer periphery of the case at a position opposed to the circuit board in a diameter direction. Therefore,

in the case of the electronic timepiece of the analog type, when electricity is directly fed from the battery to the IC of the circuit board, it is necessary to extend an electricity feeding terminal long in the case.

Further, there is proposed a constitution per se of fixing a cabinet of a quartz oscillator to a main plate mechanically stably (JP-A-2002-62377 and JP-A-2001-74869), particularly, there is known a constitution per se in which with regard to a battery plus terminal having a main body portion extended along a main face of a timepiece main body and a fold-to-bend piece portion which is folded to bend in right angle relative to the main body portion and a front end of which is brought into press contact with a peripheral face of a plus pole of a battery, a slender branch-like spring portion is extended from a main body portion of the battery plus terminal along the main face of the timepiece main body and a cabinet of a quartz oscillator is pressed to fix by a front end of the extended spring portion (JP-A-2000-81491).

The invention has been carried out in view of the above-described point and it is an object thereof to provide an electricity feeding mechanism capable of feeding electricity to a circuit board by a minimum size and an electronic timepiece having the same.

SUMMARY OF THE INVENTION

In order to achieve the above-described object, an electricity feeding mechanism of the invention includes an electricity feeding member having a battery pole contact terminal portion electrically brought into contact with an electric pole of a battery at one end thereof and an oscillator cabinet contact terminal portion electrically brought into contact with a metal cabinet at a vicinity of one end portion of the metal cabinet of a quartz oscillator at other end thereof, and an electricity feeding terminal portion electrically brought into contact with the metal cabinet of the quartz oscillator at a vicinity of other end portion of the metal cabinet of the quartz oscillator and electrically connected to an electricity feeding line of a circuit board mounted with the quartz oscillator.

The electricity feeding mechanism of the invention is provided with "the electricity feeding member having the battery pole contact terminal portion electrically brought into contact with the electric pole of the battery at the one end and the oscillator cabinet contact terminal portion electrically brought into contact with the metal cabinet at the vicinity of the one end portion of the metal cabinet of the quartz oscillator at the other end" and therefore, a potential of the electric pole of the battery on one side is applied to the metal cabinet of the oscillator by the electricity feeding member. Further, the electricity feeding mechanism of the invention

is further provided with "the electricity feeding terminal portion electrically brought into contact with the metal cabinet of the quartz oscillator at the vicinity of the other end portion of the metal cabinet of the quartz oscillator and electrically connected to the electricity feeding line of the circuit board mounted with the quartz oscillator" and therefore, the potential conducted to the metal cabinet of the quartz oscillator is conducted to the electricity feeding terminal portion via the metal cabinet per se from a portion of the metal cabinet remote from the circuit board mounted with the quartz oscillator to a portion thereof proximate to the circuit board, and finally, a potential of the portion of the metal cabinet proximate to the circuit board is conducted to the electricity feeding line of the circuit board by the electricity feeding terminal portion. That is, according to the electricity feeding mechanism of the invention, the metal cabinet of the oscillator can be operated as a portion of electricity feeding path means. Therefore, in comparison with a case in which electricity is fed directly from the electric pole of the battery on the one side to a power source terminal of the quartz oscillator by the electricity feeding path means, a length of the electricity feeding path means can be shortened actually by an amount of a length between the both end portions of the metal cabinet and electricity can be fed to the circuit board by a minimum size.

That is, as described above, in a case of an electronic

timepiece of an analog type, a quartz oscillator, a motor and a battery are parts having large sizes similar to the train wheel for the timepiece and therefore, when the train wheel for the timepiece is arranged predominantly at a center portion in a case to be adapted to a display by a time display hand as well as the winding stem is projected from the side wall of the case, the motor and the quartz oscillator are arranged along an outer periphery of the case by interposing the circuit board, the battery is arranged at a vicinity of the outer periphery of the case at a position opposed to the circuit board in a diameter direction. Here, according to the electricity feeding member of the electricity feeding mechanism of the invention, instead of directly connecting the electric pole of the battery and the electricity feeding line of the circuit board, by connecting the electric pole of the battery to a portion proximate to an end portion of the metal cabinet of the quartz oscillator extended to a location more proximate to the electric pole than the circuit board, the size can be minimized.

In this case, the electric pole of the battery is typically a plus pole and the electricity feeding member functions as a battery plus terminal. However, when desired, the electric pole may be a battery minus terminal connected to a minus pole of the battery.

The electricity feeding mechanism of the invention is typically constituted such that the electricity feeding member

is constituted by a slender plate-like structure, the plate-like structure is arranged at a main face of a timepiece main body by constituting an angle therebetween, the battery pole contact terminal portion is elastically pressed to the electric pole of the battery, and the oscillator cabinet contact terminal portion is elastically pressed to the metal cabinet of the quartz oscillator. Here, although the angle is typically 90 degrees (right angle) substantially, when desired, the angle may be more or less inclined.

In this case, an occupied area viewed from a direction orthogonal to the main face of the timepiece main body can be minimized.

The electricity feeding mechanism of the invention is typically constituted such that the electricity feeding member is supported by a machine frame of the timepiece main body by being pinched by a groove portion or between projected portions of the machine frame of the timepiece main body at a middle portion between the battery pole contact terminal portion and the oscillator cabinet contact terminal portion. The projected portions may be opposed to each other or may be arranged in zigzag. Supporting by the machine frame may be holding by side walls of the groove portion or the projected portions per se of the machine frame, or may be holding constituted by pressing a center portion of the electricity feeding member pinched in a loosely fitted state in the groove portion or between the

projected portions of the machine frame to the side of the groove portion or the projected portions by bringing both ends of the electricity feeding member into press contact with the battery and the oscillator cabinet.

In this case, the electricity feeding member can be supported mechanically stably and solidly and therefore, the cabinet of the quartz oscillator can stably be positioned by being mechanically pressed by the oscillator cabinet contact terminal portion by constituting a reaction force thereof. The same goes with the battery.

An electronic timepiece of the invention includes the above-described electricity feeding mechanism. According to the electronic timepiece of the invention, typically, the electricity feeding member includes a reset lever deviating spring portion for exerting a deviating force from a nonreset position to a reset position to a reset lever at one end edge in a width direction. In this case, the reset lever can be formed by a rigid plate-like member and reset operation is easy to be carried out stably.

According to the electronic timepiece of the invention, one end edge thereof in a width direction includes a winding stem positioning and engaging portion elastically engaged with a small diameter portion contiguous to an abacus bead shape portion having a large diameter of the winding stem for permitting to pass the abacus bead shape portion by being

elastically deformed by the abacus bead shape portion in bringing in and out the winding stem. In this case, an area occupied when a spring portion required for providing a click feeling in positioning and bringing in and out the winding stem is viewed in a direction orthogonal to the main face of the timepiece main body can be minimized.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

A preferred form of the present invention is illustrated in the accompanying drawings in which:

Fig. 1 is a plane explanatory view of a main body portion of an electronic timepiece according to a preferable embodiment of the invention having a plate spring structure as an electricity feeding member according to a preferable embodiment of the invention (a state of removing a train wheel bridge);

Fig. 2 is an explanatory view of a section taken along a line II-II of Fig. 1;

Figs. 3 show arrangements of a plate spring structure, Fig. 3A is an explanatory view of a section taken along a line IIIA-IIIA of Fig. 1, Fig. 3B is a plane explanatory view of a portion viewed in a IIIB-IIIB line direction of Fig. 3A, Fig. 3C is an explanatory view of a section taken along a line IIIC-IIIC of Fig. 3A, and Fig. 3D is an explanatory view of a section of a modified example of Fig. 3C similar to Fig. 3C;

Fig. 4 is a perspective explanatory view of the plate

spring structure of Fig. 1;

Figs. 5 show states of supporting a quartz oscillator cabinet of Fig. 1, Fig. 5A is an explanatory view of a section taken along a line VA-VA of Fig. 1, Fig. 5B is an explanatory view of a section of a modified example of Fig. 5A similar to Fig. 5A, Fig. 5C is an explanatory view of a section of other modified example of Fig. 5A similar to Fig. 5A, Fig. 5D is an explanatory view of a section of still other modified example of Fig. 5A similar to Fig. 5A, and Fig. 5E is an explanatory view of a section taken along a line VE-VE of Fig. 1;

Fig. 6 is a plane explanatory view when the electronic timepiece of Fig. 1 is brought into a nonreset state;

Fig. 7 is a plane explanatory view when the electronic timepiece of Fig. 1 is brought into a reset state; and

Figs. 8 show modified examples of the electronic timepiece of Fig. 1, Fig. 8A is a plane explanatory view similar to Fig. 1 shown in a state of omitting a train wheel or the like, Fig. 8B is an explanatory view of a section taken along a line VIIIB-VIIIB of Fig. 8A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Next, a preferable embodiment of the invention will be explained based on a preferable embodiment shown in attached drawings.

A timepiece main body 2 of an electronic timepiece 1 is

provided with a main plate 10 constituting a machine frame. In the following, a three-dimensional coordinates system fixed to the main plate 10 is adopted for simplifying the explanation. Here, X direction is constituted by a direction A1 of drawing a winding stem 20 (3 o'clock side), Y direction is constituted by a right direction (12 o'clock side) in Fig. 1 and Z direction is constituted by a depth direction of the drawing orthogonal to the drawing. Z direction coincides with a side having a dial 12 (refer to Fig. 2). Here, XY plane is in parallel with a main face of the timepiece main body 2 and a direction of Z axis is a direction orthogonal to the main face of the timepiece main body 2. In Fig. 1 and Fig. 2, notation C designates a rotational center axis line of time display hands 13 (that is, hour hand 13a, minute hand 13b, second hand 13c) connected to a train wheel mechanism 3 of the timepiece main body 2. Here, the timepiece main body 2 indicates a portion excluding an exterior portion of a case or the like from the timepiece 1.

The main plate 10 is provided with recesses and projections and a surface shape suitable for arranging and supporting various timepiece elements to be positioned at respective positions of -Z side surface 10a of the main plate 10. The main plate 10 includes a side wall 11 (Fig. 2) having a winding stem guide hole 11a at a position on 3 o'clock side, and is provided with a quartz oscillator cabinet (quartz can) receiving projected portion 11f and a flexible circuit board mounting projected

portion 11g projected at -Z side surface 10a as well as a clutch wheel receiving recess portion 11h formed at the surface 10a and a battery containing recess portion 11b specifying a portion of a peripheral wall by the side wall 11 or the like. A flexible circuit board mounting projected portion 11g is provided with a quartz oscillator cabinet (quartz can) end face receiving side wall portion 11c as described later in reference to Fig. 5E. Further, a reset pin 32 is implanted substantially in 5 o'clock direction of the hour hand in view from the center axis line C in the surface 10a of the main plate 10. The position of the reset pin 32 may be other position depending on arrangement and shape of a circuit board 34, mentioned later, or the like.

The winding stem 20 penetrating the winding stem guide hole 11a of the main plate 10 is provided with a square cylinder shape engaging shaft portion 22 at a front end, a cylindrical shape middle diameter shaft portion 23 at a middle, a cylindrical shape small diameter shaft portion 24 between the shaft portions 22, 23, an abacus bead shape portion 27 both sides in A1, A2 directions of which are specified by small diameter shaft portions 25, 26 in addition to a large diameter shaft portion 21 on a base end side, and is fitted to a clutch wheel 28. The clutch wheel 28 having a middle diameter hole portion on a base end side and a square cylinder shape hole portion on a front end (depth) side is disposed in the clutch wheel receiving recess portion 11h and is fitted to the winding stem 20 among the shaft

portions 22, 24, 23. When the winding stem 20 is disposed at a 0-stage position (normal position) at which the winding stem 20 is pushed in A2 direction, the middle diameter hole portion and the square cylinder shape hole portion of the clutch wheel 28 are respectively fitted to the middle diameter portion 23 and the small diameter shaft portion 24 of the winding stem 20 rotatably. On the other hand, when the winding stem 20 is disposed at a 1-stage position (drawn position) at which the winding stem 20 is drawn by one stage in A1 direction, the square cylinder shape hole portion of the clutch wheel 28 is engaged with the square cylinder shape engaging shaft portion 22 of the front end of the winding stem 20 and the clutch wheel 28 is rotated in accordance with rotation of the winding stem 20 in B direction. The clutch wheel 28 is brought in mesh with an eighth wheel 15f at a wheel portion 28a at a front end thereof.

As is known from Fig. 1, Fig. 2, the train wheel mechanism 3 includes a top side train wheel 15 disposed between the main plate 10 and a portion of a train wheel bridge 14 disposed at an interval from the main plate 10 in -Z direction and a bottom side train wheel 16 disposed on +Z side of the main plate 10. The train wheel bridge 14 can be regarded as a portion of a machine frame similar to the main plate 10. The top side train wheel 15 includes a sixth wheel & pinion 15a, a fifth wheel & pinion 15b, a fourth wheel & pinion (second wheel & pinion) 15c, a third wheel & pinion 15d, a second wheel & pinion (minute

wheel & pinion) 15e, and the eighth wheel 15f, and the bottom side train wheel 16 includes an hour wheel (hour wheel) 16a and an eighth pinion 16b. A shaft or a stem of the eighth wheel & pinion (minute wheel) 17 is extended to penetrate the main plate 10 in Z direction, the eighth wheel 15f is provided on a side of the top train wheel 15, and the eighth pinion 16b is provided on a side of the bottom side train wheel 16. A shaft portion of the third wheel & pinion 15d proximate to the main plate 10 is fitted to a bearing hole 66a of a reset lever 60, mentioned later.

In Fig. 1, a motor 4 slender in Y direction is arranged at a position of the surface 10a of the main plate 10 on a side opposed to the winding stem 20, that is, on 9 o'clock side. In Fig. 1, on a right side of the winding stem 20 and the motor 4, a button type battery 5 is arranged at the battery containing recess portion 11b specifying a portion of the peripheral wall. Further, in Fig. 1, on a left side of the winding stem 20 and the motor 4, there is arranged a circuit block 6 including a flexible circuit board 34 mounted with an IC (integrated circuit) 33 for a timepiece and a quartz oscillator 30. The board 34 is mounted with also a circuit part other than IC 33 as desired.

The motor 4 includes a stator 4a and a coil block 4b as well as a rotor 4c and a shaft of the rotor 4c is formed with a rotor pinion constituting the sixth wheel & pinion 15a. The coil block 4b of the motor 4 is electrically connected to the

flexible circuit board 34 by an extended portion 4d of the winding.

Notations 36a, 36b designate connecting portions for integrally connecting the stator 4a and the coil block 4b mechanically. At a location of the connecting portion 36a, the circuit board 34 is fixed to the motor 4 and at a location of the connecting portion 36b, a battery minus terminal 7 is fixed to the motor 4. The connecting portions 36a, 36b are provided with openings at centers thereof, projections projected from the main plate 10 are fitted and thermally calked to the openings, and a total of the motor 4, the circuit board 34 and the like is fixed to the main plate 10. The battery minus terminal 7 is extended to +Z side of the battery 5 along the surface 10a of the main plate 10 and is brought into contact with a negative pole 5a (Fig. 3A) at an end face of the battery 5 mounted on the surface 10a of the main plate 10. The battery minus terminal 7 is electrically connected to the circuit board 34 via the motor 4 (for example, a winding core insulated from the stator member 4a and the winding of the coil block 4b or the like) to provide a minus potential of the battery 5 to the circuit board 34. That is, a conductive portion per se of the part of the motor 4 constitutes an electricity feeding line on a minus side of a power source in corporation with the battery minus terminal 7.

An end portion on -Z side of the shaft portion of the

rotor 4c of the motor 4 is rotatably supported by the train wheel bridge 14. The coil block 4b having a large diameter of the motor 4 is projected in -Z direction and may be loosely fitted into a corresponding notch or opening (not illustrated) of the train wheel bridge 14 or may be held by the train wheel bridge 14. Similarly, also the battery 5 having a high height in -Z direction is loosely fitted into a corresponding battery attaching and detaching opening (not illustrated) of the train wheel bridge 14. When a premise is constituted by using the battery 5 in service life range of the battery 5, the battery 5 may be pressed by the train wheel bridge 14.

At a center side side edge of the timepiece main body 2 in the surface on +Z side of the flexible circuit board 34 of the circuit block 6, a reset pin connecting conductive pad portion 35a is formed, and when the flexible circuit board 34 is mounted on the main plate projected portion 11g having a plane shape actually the same as that of the board 34 in the illustrated example, the conductive pad portion 35a is precisely brought into contact with -Z side end face (top face) of the reset pin 32. Naturally, the shape of the projected portion 11g may be different from that of the flexible circuit board 34 so far as the flexible circuit board 34 can be supported thereby by desired stability. Further, in a state of attaching the train wheel bridge 14, the train wheel bridge 14 presses the conductive pad portion 35a of the circuit board 34 to the

top face of the reset pin 32. However, electric connection between the reset pin 32 and the circuit board 34 may be realized by a different mode.

The circuit block 6 is further formed with conductive patterns 35b, 35c, 35d and the conductive pattern 35d is attached with a connecting terminal piece portion 35e. The conductive pattern 35d is connected to an electricity feeding terminal of a power source voltage (potential) V_{dd} of IC 33 for the timepiece and the conductive patterns 35b, 35c are connected to terminals of the quartz oscillator 30. The conductive patterns 35b, 35c are electrically connected and fixed with a pair of connecting pins or connecting terminal portions 30a, 30b of the quartz oscillator 30 by soldering. The connecting terminal piece portion 35e electrically connected to the conductive pattern 35d at a base end thereof is extended along the surface 10a of the main plate 10 and is brought into contact with +Z side portion of a peripheral face of a conductive can, that is, a base end portion 31a of a quartz can 31 as a cabinet of the quartz oscillator 30 mounted on the surface 10a of the main plate 10. Further, a base portion side end face 31d of the quartz oscillator main body 31 is brought into contact with the quartz oscillator cabinet (quartz can) end face receiving sidewall portion (side face portion) 11c of the flexible circuit board mounting projected portion 11g of the main plate 10 (Fig. 5E).

The train wheel bridge 14 is formed with a groove 18 (Fig. 2) as an engaging portion and a plate spring structure 50 made of a metal is locked by the groove 18. A main face or a surface of the plate spring structure 50 is orthogonal to an XY plane as shown by Figs. 3 and Fig. 4 in addition to Fig. 1 and Fig. 2. That is, a normal line relative to the main face of each portion of the plate spring structure 50 is disposed in a face in parallel with the XY plane regardless of the direction of the main face.

As is known from Fig. 1, Figs. 3 and Fig. 4, the plate spring structure 50 includes a main body portion 51 extended substantially in Y direction along the timepiece main body 2. The plate spring main body portion 51 is provided with a center portion 52 extended in Y direction, a battery plus pole contact terminal portion 53 which is extended from an end portion in + Y direction of the center portion 52 to -X side in a skewed direction by an obtuse angle relative to the center portion 52 and a front end of which is brought into press contact elastically with a peripheral face of the battery 5 constituting a portion of a plus pole 5b of the battery 5, and a quartz can contact terminal portion 54 which is extended from -Y direction end portion of the center portion 52 to -X side in a skewed direction by an obtuse angle relative to the center portion 52 and a front end of which is brought into press contact elastically with a side edge 31c of a front end portion 31b

of the quartz can 31 constituting the quartz oscillator cabinet. The plate spring structure 50 comprises a stainless steel alloy plate having a thickness of, for example, about 0.15 through 0.2 mm. Naturally, the thickness and the material may be different therefrom.

The battery plus pole contact terminal portion 53 includes an inclined arm portion 53a extended from an end portion in +Y direction of the center portion 52 to -X side in a skewed direction by an obtuse angle relative to the center portion 52, and a battery plus pole contact portion 53b further extended from a front end of the inclined arm portion 53a to -X side skewedly by an obtuse angle, and is brought into press contact with the battery plus pole 5b by a front end portion of the battery plus pole contact portion 53b. A fold-to-bend angle of the contact portion 53b relative to the center portion 52 is smaller than 90 degrees as a whole. According to the example, the center portion 52 is wide in a width thereof in Z direction at a vicinity of the end portion in +Y direction, and a side edge 53c on -Z side of the battery plus pole contact end portion 53 is partially notched. Further, the contact portion 53b of the front end of the battery plus pole contact end portion 53 ensures a wide contact region for the battery plus electrode 5b by providing a front end portion 53d rising in -Z direction and extended straight further frontward from the rising end portion (Fig. 3A).

The quartz can contact end portion 54 is provided with a slender arm portion 54a and a quartz can contact portion 54b formed at a front end portion of the arm portion 54a in a wide width in Z direction, and is brought into press contact with the side edge 31c of the front end portion 31b of the quartz can 31 at the contact portion 54b.

Therefore, the plate spring structure 50 functions as a battery plus terminal directly applying the voltage (potential) of the plus pole 5b of the battery 5 to a power source terminal IC 33 via the contact terminal piece portion 35e and the conductive pattern 35d constituting the electricity feeding line by being brought into contact with the plus electrode 5b of the battery 5 at the battery plus pole contact terminal portion 53 and brought into contact with the quartz can 31 at the quartz can contact terminal portion 54. In the above-described, the electricity feeding mechanism 9 is constituted by the plate spring structure 50 and the connecting terminal piece portion 35e.

In this case, the quartz can 31 per se is utilized as an electricity conducting path and therefore, in comparison with a case of connecting the plus pole 5b of the battery 5 and the power source terminal 35d of the circuit board 34 directly by a battery plus terminal, actually, a length of the plate spring structure 50 can be shortened by an amount of a length of the quartz can 31. Further, when a path of the battery plus

terminal is going to be ensured at a location of the train wheel mechanism portion 3 having the train wheel, whereas not only a degree of freedom of layout of various parts is reduced but also it is necessary to constitute the battery plus terminal by a complicated plane shape or a complicated fold-to-bend shape, in this case, the plate spring structure 50 can be constituted by a comparatively simple shape.

As shown by Figs. 3, the plate spring structure 50 is fitted to a groove 18b of a projected portion 18a of the engaging portion 18 of the train wheel bridge 14 (Fig. 3A and 3C) at the center region 52a of the center portion 52 and is fitted to an opening portion 18c (Figs. 3A and 3B) of the train wheel bridge 14 at a projected portion 52b formed at a side edge on -Z side of the center portion 52. Instead of forming the groove 18b for inserting the plate spring structure 50 at the projected portion 18a of the train wheel bridge 14 as shown by Fig. 3C, the plate spring structure 50 may be supported by forming in zigzag a plurality of projected portions 18d, 18e, 18f at the train wheel bridge 14 to form a narrow linear path and inserting a portion of the plate spring structure 50 (for example, center portion 52) among projected portions 18d, 18e, 18f to thread the projected portions 18d, 18e, 18f. The projected portion may be constituted by a cross-sectional shape to be brought into line contact with the plate spring structure 50 (line contact in a plane of Fig. 3D) as shown by Fig. 3D or may be

a shape brought into face contact as in a sidewall or the projected portion 18a constituting the groove 18b of Fig. 3C (line contact in a plane of Fig. 3C). Supporting of the plate spring structure 50 as shown by Figs. 3A, 3C, 3D may be carried out by the main plate 10 in place of the train wheel bridge 14 or may be carried out by both the train wheel bridge 14 and the main plate 10. The projected portions 18d, 18e, 18f may be constituted by pins made of a metal projected from the train wheel bridge 14 or the main plate 10 in place of resin members forming a base material of the train wheel bridge 14 or the main plate 10. The plate spring structure 50 may loosely be fitted in the groove portion 18b or among the projected portions 18d, 18e, 18f or may actually be supported thereby without play.

The plate spring structure 50 is constituted by a leaf spring extended in Y direction and having a width in Z direction as a whole and therefore, an area occupied in XY plane can be minimized. Further, terminal portions 53, 54 at both ends inserted through the groove portion 18b or the like can be held by actually constituting a fulcrum by a side wall of the groove portion 18b or the like by only being locked to be brought into press contact with the battery 5 and the quartz oscillator cabinet 31, a fixing structure of screwing, calking or the like is not needed and therefore, also a space necessary for holding the terminal portions 53, 54 can be minimized.

The plate spring structure 50 further includes a reset

lever deviating spring portion 56 and a winding stem engaging spring portion 57 projected from a side edge portion thereof on +Z side. The winding stem engaging spring portion 57 includes a base side arm portion 57a extended in +Z direction from the main body portion 51, a front end side arm portion 57b extended from an extended end of the base side arm portion 57a in +Y direction, and a circular arc shape engaging portion 57c extended from a front end of the arm portion 57b and is elastically engaged with the small diameter portion 25 or 26 at a vicinity of the abacus bead shape portion 27 of the winding stem 20 at the circular arc engaging portion 57c.

As is known from Fig. 1 and Figs. 3, the plate spring structure 50 is supported by the train wheel bridge 14 by being engaged with the engaging portion 18 of the train wheel bridge 14 at the center portion 52, the battery plus pole contact terminal portion 53 disposed at an end portion in +Y direction is brought into press contact elastically with a peripheral face of the plus pole 5b of the battery 5 in D direction, and the quartz can contact terminal portion 54 disposed at an end portion in -Y direction is brought into press contact elastically in E direction with the side edge 31c of the front end portion 31b of the quartz can 31 supported by the quartz oscillator cabinet receiving projected portion 11f and the quartz oscillator cabinet (quartz can) end face receiving side wall portion (side face portion) 11c of the main plate 10. Therefore,

the plate spring structure 50 can elastically press the battery 5 and the quartz oscillator 30 by constituting a fulcrum by the engaging portion 18 of the train wheel bridge 14 and therefore, both the battery 5 and the quartz oscillator 30 sizes of which are larger than those of other parts to be easy to deteriorate mounting stability can simultaneously and stably be positioned to fix. Further, the plate spring structure 50 is brought into contact with the battery 5 by large contact pressure at one end thereof and brought into contact with the quartz can 31 of the quartz oscillator 30 by large contact pressure at other end thereof and therefore, the plus potential of the battery 5 can firmly be conducted to the quartz can 31. Further, the quartz can 31 is connected to the power source voltage feeding terminal of IC 33 of the circuit block 6 via the contact terminal piece portion 35e and the conductive pattern 35d and therefore, the cabinet of the quartz oscillator 30, that is, the quartz can 31 can directly be utilized for supplying the power source voltage. The quartz oscillator cabinet portion or the quartz can 31 occupies large volume or area in the main body portion 2 of the electronic timepiece 1 and therefore, a length of the battery plus terminal can be minimized.

Further, the spring structure 50 exerts an elastic force in F1 direction to the winding stem 20 by being engaged with the small diameter portions 25, 26 on both sides of the abacus bead shape portion 27 of the winding stem 20 at the circular

arc shape engaging portion 57c of the winding stem engaging spring portion 57 and therefore, the winding stem 20 engaged elastically with the spring portion 57 by the small diameter portion 25 or 26 can elastically be held stably without being positionally shifted in A1, A2 direction and the winding stem 20 can be positioned. Further, since engagement between the spring portion 57 and the small diameter portion 25 or 26 is elastic engagement, for example, in the case in which the winding stem 20 is drawn in A1 direction when the winding stem 20 is disposed at 0-stage position and the circular arc shape engaging portion 57c of the spring portion 57 is engaged with the small diameter portion 25 of the winding stem 20, the abacus bead shape portion 27 is moved in A1 direction by elastically deforming the circular arc shape engaging portion 57c of the spring portion 57 to press down in F2 direction by the abacus bead shape portion 27 having a diameter larger than that of the small diameter portion 25. When the abacus bead shape portion 27 is passed through the spring portion 57 in A1 direction, the circular arc shape engaging portion 57c of the spring portion 57 is deformed again in F1 direction by an elastic recovery force and is fitted to the small diameter portion 26. Thereby, in drawing the winding stem 20 in A1 direction, the spring portion 57 of the spring structure 50 can provide a click feeling in corporation with the abacus bead shape portion 27. Also in pressing the winding stem 20 from winding stem 1 stage to winding

stem 0 stage in A2 direction, the engaging portion 57c of the spring portion 57 is deformed to permit to pass the maximum diameter portion of the abacus bead shape portion 27 from the small diameter portion 26 and thereafter fitted to the small diameter portion 25 and therefore, a similar click feeling is provided.

Further, in supporting the spring portion 57 as described above, the spring structure 50 is not only held by the engaging portion 18 of the train wheel bridge 14 but also supported by the battery 5 and the quartz can 31 via the both end spring portions 53, 54 as reaction of elastically pressing the battery 5 and the quartz can 31 at the both end portions 53, 54 and therefore, support of the winding stem 20 can be stabilized in a stably held state. Further, in order to avoid the arm portions 57a, 57b of the winding stem engaging spring portion 57 from being considerably deformed in Y direction, restricting wall portions may be formed on +Y side and on -Y side of the arm portions 57a, 57b to interpose the arm portions 57a, 57b via gaps therebetween. The restricting wall portion may be a portion of the engaging portion 18 or the like.

Further, when desired, the surface 10a of the main plate 10 may be formed with a projected portion projected in -Z direction and the side edge portion 52d (Figs. 3) on +Z side of the center portion 52 of the spring structure 50 may be supported by the projected portion. In this case, the center

portion 52 can firmly be prohibited from being displaced in +Z direction and therefore, the spring portion 57 can firmly provide the click feeling.

The electronic timepiece 1 is further provided with a reset lever 60 constituting the reset lever main body portion. According to the example, the reset lever 60 is provided with a plate-like portion 60a constituted by a drawn sheet metal member having a shape of a sea horse or the like as a whole, and a shaft portion 60b for rotatably supporting the plate-like portion 60a around a rotational center axis line C1 at a center portion relative to the main plate 10. The shaft portion 60b may rotatably be supported by a bearing hole of the main plate 10, or the plate-like portion 60a may be rotatable relative to the shaft portion 60b. The shaft portion 60b may further be supported by the train wheel bridge 14, or may be supported by the train wheel bridge 14 in place of the main plate 10.

The reset lever plate-like portion 60a includes an L-like shape arm portion 62 extended from a center boss portion or a fat portion 61 extended to a region including the rotation center axis line C1 to a front end of the winding stem 20, a spring receive portion or an engaging projected portion 63 projected from the boss portion 61 in X direction and engaged with the spring portion 56, an up and down direction arm portion 64 extended from the boss portion 61 substantially in -X direction, a transverse direction arm portion 65 extended

substantially in -Y direction from an extended end of the up and down direction arm portion 64 extended slightly skewedly while avoiding the battery 5, a fat portion for a bearing of the third wheel & pinion or a boss portion 66 formed at a front end of the arm portion 65, and a reset terminal portion 67 skewedly extended from the boss portion 66 to a location of the reset pin 32. In the above-described, the boss portion 61 as well as the L-like shape arm portion 62 and the engaging projected portion 63 constitute an input side lever portion 68 and the arm portions 64, 65, 67 and the boss portion 66 constitute an output side lever portion 69. Further, in the above-described, the reset lever apparatus 8 is constituted by the reset lever 60, and the spring portion 56 of the plate spring structure 50.

When the winding stem 20 is disposed at winding stem 0 stage P0 pressed in A2 direction, a side edge 62b of a position detecting arm portion 62a on a front end side of the L-like shape arm portion 62 of the reset lever 60 is pressed in A2 direction from a front end face 29 of the winding stem 20. Although in order to avoid the winding stem 20 from being exerted with an excessive A1 direction reaction force, the L-like shape arm portion 62 can more or less be flexed typically, the L-like arm portion 62 is provided with a rigidity far higher than that of the reset lever deviating spring portion 56 of the plate spring structure 50 and can substantially be regarded as a rigid

body so far as the L-like shape arm portion 62 is compared with the spring portion 56.

When the winding stem 20 is disposed at the winding stem 0 stage P0 pressed in A2 direction, the spring receive portion or the engaging projected portion 63 of the reset lever 60 is pressed in -Y direction relative to a side edge 56b on +Y side of a front end portion 56a of the reset lever deviating spring portion 56 of the plate spring structure 50 to elastically deform the deviating spring portion 56 to shift the front end portion 56a of the reset lever deviating spring portion 56 in G1 direction (bold line of Figs. 3).

Therefore, when the winding stem 20 is disposed at the winding stem 0 stage, as shown by Fig. 6, the reset lever 60 adopts a nonreset position H1. That is, when the winding stem 20 is disposed at the winding stem 0 stage, the input side lever portion 68 presses the spring portion 56 of the plate spring structure 50 in G1 direction by being displaced to pivot in J1 direction under operation of the pressing force in A2 direction by the front end face 29 of the winding stem 20. Also the output side lever portion 69 of the reset lever 60 is displaced to pivot in J1 direction and the reset terminal portion 67 adopts a nonreset position K1 at which a side edge 67a of a front end thereof is separated from the reset pin 32. Further, when the reset lever 60 adopts the nonreset position H1, a third wheel & pinion support shaft bearing portion 66a adopts an engaging

portion L1, the third wheel & pinion 15d is brought in mesh with the second wheel & pinion 15e to transmit rotation of the fourth wheel & pinion 15c to the second wheel & pinion 15e.

On the other hand, when as shown by Fig. 7, the winding stem 20 is drawn in A1 direction and adopts a winding stem 1 stage position P1, the front end face 29 of the winding stem 20 is moved in A1 direction, and is separated from the side edge 62b of the position detecting arm portion 62a of the L-like arm portion 62 of the reset lever 60. In accordance with releasing the force of displacing to pivot the input side lever portion 68 in J1 direction, by an elastic recovery force in G2 direction exerted to the projected portion 63 by the spring portion 56 of the plate spring structure 50, the input side lever portion 68 is pivoted in J2 direction around the center axis line C1. Therefore, also the output side lever portion 69 is displaced to pivot in J2 direction, and the reset terminal portion 67 is pressed to the reset pin 32 at the side edge portion 67a of the front end. That is, when the winding stem 20 is drawn in A1 direction and adopts the winding stem 1 stage position P1, the reset lever 60 adopts a reset position H2, and the reset terminal portion 67 is set to a reset position K2 at which the reset terminal portion 67 is brought into contact with the reset pin 32. As a result, supply of a signal for driving the motor 4 from the circuit block 6 is stopped, rotation of the motor 4 is stopped, and the rotation of the second hand 13c is stopped.

Further, when the reset lever 60 adopts the reset position K2, the third wheel & pinion support bearing portion 66a adopts a nonengaging portion L2, the third wheel & pinion 15d and the second wheel & pinion 15e are released from being brought in mesh with each other, and rotation of the second wheel & pinion (minute wheel) 15e is not transmitted to the fourth wheel & pinion (second wheel) 15c. Further, by displacing by the third wheel & pinion support bearing portion 66a, instead of releasing the third wheel & pinion 15d and the second wheel & pinion 15e from being brought in mesh with each other, the third wheel & pinion 15d and the fourth wheel & pinion 15c may be released from being brought in mesh with each other.

When the third wheel & pinion 15d and the second wheel & pinion 15e are released from being brought in mesh with each other, even when rotation of the winding stem 20 for hand movement is transmitted from the clutch wheel 28 to the hour wheel (hour wheel) 16a and the second wheel & pinion (minute wheel) 15e via the minute wheel 17, rotation is not transmitted to the fourth wheel & pinion (second wheel & pinion) 15c and therefore, the minute hand 13b and the hour hand 13a can be set in a state of stopping the second hand 13c.

Further, instead of supporting the side face of the quartz oscillator cabinet (quartz can) 31 only by the quartz oscillator cabinet receiving projected portion 11f of the main plate 10 as shown by Fig. 5A, as shown by Fig. 5B, a projected portion

14a similar to the projected portion 11f may be formed also at the train wheel bridge 14 and the side face of the quartz oscillator cabinet 31 may be supported by the projected portion 14a. For example, when a position in Z direction of the plate spring structure 50 is disposed at the surface 10a of the main plate 10 comparatively remote from the contiguous surface portion, the quartz can 31 is easy to be held by supporting the quartz can 31 in this way. Further, as shown by Fig. 5D, the train wheel bridge 14 may be provided with an eaves shape receiving portion 73 and a side face of the quartz can 31 may positively be received by the eaves shape receiving portion 73. Further, in order to stably mount the quartz oscillator main body 31 at a vicinity of the quartz oscillator cabinet receiving projected portion 11f of the main plate 10 even in a state in which the pressing force by the leaf spring 50 is not exerted, as shown by Fig. 5C, a side wall portion 11d opposed to the quartz oscillator cabinet receiving projected portion 11f may further be formed in order to form a recess portion for mounting the oscillator main body 31 at the surface 10a of the main plate 10.

Further, the shape of the plate spring structure may differ so far as the plate spring structure is brought into press contact with the quartz can 31 and the plus pole 5b of the battery 5 at the quartz can contact terminal portion and the battery plus pole contact terminal portion. Figs. 8 show such a modified

examples. In the modified example shown in Figs. 8, members, portions or elements similar to those of Fig. 1 are attached with the same notations and portions which are changed therefrom are attached with added characters W at final portions of the same notations.

According to a plate spring structure 50W of an electronic timepiece 1W shown in Figs. 8, a quartz can contact terminal portion 54W is considerably folded to bend relative to the center portion 52 and a contact portion 54bW at a front end thereof is pressed to the quartz can 31. Further, the plate spring structure 50W is supported by pins 71, 72 implanted to the machine frame 10 or 14 at a vicinity of the quartz can contact terminal portion 54W of the center portion 52. According to the example, the pin 72 is operated as a fulcrum in a state of being brought into press contact with the quartz can 31 and the battery 5 at the contact terminal portions 54W, 53 at both ends thereof. Positions and numbers of the pins 71, 72 may differ.

Further, according to the electronic timepiece 1W of Figs. 8, as is known from Fig. 8B in addition to Fig. 8A, the train wheel bridge 14 is provided with the eaves shape receiving portion 73 and the side face of the quartz can 31 is received by the eaves shape receiving portion 73. Further, Fig. 8B corresponds to Fig. 5D.

It is apparent that in the electronic timepiece 1W constituted as described above, the plate spring structure 50W

can function similar to the plate spring structure 50 shown in Fig. 1 and the like. The plate spring structure 50W may be provided with or may not be provided with the reset lever deviating spring portion 56 or the winding stem engaging spring portion 57.

What is claimed is:

1. An electricity feeding mechanism comprising:

an electricity feeding member having a battery pole contact terminal portion electrically brought into contact with an electric pole of a battery at one end thereof and an oscillator cabinet contact terminal portion electrically brought into contact with a metal cabinet at a vicinity of one end portion of the metal cabinet of a quartz oscillator at other end thereof; and

an electricity feeding terminal portion electrically brought into contact with the metal cabinet of the quartz oscillator at a vicinity of other end portion of the metal cabinet of the quartz oscillator and electrically connected to an electricity feeding line of a circuit board mounted with the quartz oscillator.

2. An electricity feeding mechanism according to Claim 1, wherein the electricity feeding member is constituted by a slender plate-like structure, the plate-like structure is arranged at a main face of a timepiece main body by constituting an angle therebetween, the battery pole contact terminal portion is elastically pressed to the electric pole of the battery, and the oscillator cabinet contact terminal portion is elastically pressed to the metal cabinet of the quartz oscillator.

3. An electricity feeding mechanism according to Claim

2, wherein the electricity feeding member is supported by a machine frame of the timepiece main body by being pinched by a groove portion or between projected portions of the machine frame of the timepiece main body at a middle portion between the battery pole contact terminal portion and the oscillator cabinet contact terminal portion.

4. An electronic timepiece including the electricity feeding mechanism according to Claim 1.

5. An electronic timepiece including the electricity feeding mechanism according to Claim 2, wherein the electricity feeding member includes a reset lever deviating spring portion for exerting a deviating force from a nonreset position to a reset position to a reset lever at one end edge in a width direction.

6. An electronic timepiece including the electricity feeding mechanism according to Claim 2, wherein one end edge thereof in a width direction includes a winding stem positioning and engaging portion elastically engaged with a small diameter portion contiguous to an abacus bead shape portion having a large diameter of the winding stem for permitting to pass the abacus bead shape portion by being elastically deformed by the abacus bead shape portion in bringing in and out the winding stem.