

S319

Ticking Mechanism

時計

■ Purpose of Exhibition

The clock is one of the most familiar machines to us. At first, the mechanical watch with a main spring was invented, and after that, the quartz type clock with crystal oscillation was born. Most clocks today are the quartz type.

In this exhibition, we mainly focus on introducing the mechanism of a mechanical watch so that you easily understand the principle of the ticking machine. In this explanation, we also introduce the principle quartz type clock.



■ Additional Knowledge

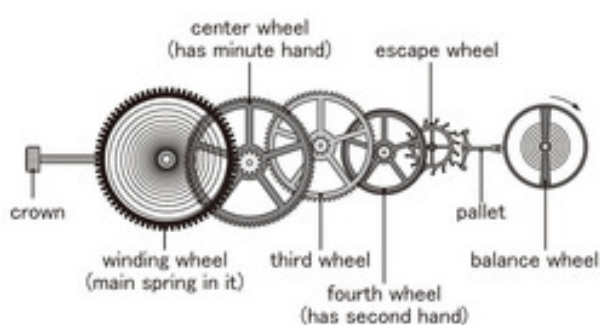


Fig. 1 Ticking mechanism

[Mechanical Watch]

The power is produced by the main spring. The source of power occurs when the rolled spring returns to its original size. At this time, the restoring force is large at the beginning, and becomes smaller when it gets closer to the original size. If the needle is connected directly with this main spring, the needle doesn't move at a constant speed. Then, it needs the mechanism that can transfer the energy at a constant speed. The features (Figure 1) that play its role are the balance wheel, pallet and escape wheel.

The balance wheel moves right and left regularly at a constant cycle. At this movement of the balance wheel, the pallet does not keep the escape wheel going at a constant cycle, but rotates or stops it constantly in timed segments. This escape wheel, when moving, transfers many gears, and moves the second hand, the minute hand and the hour hand. It can be said that the most vital point of mechanical watch mechanism is the pallet and escape wheel (Figure 1).

[Quartz Type Clock]

Though the mechanical watch was made artfully, there were some faults. As long as the main spring is used as the power, it is necessary to wind up many times to save energy. Once a week, or once a month, winding up the mainspring was forced. In addition, time lag was not rare. Energy supplement and time adjustment were

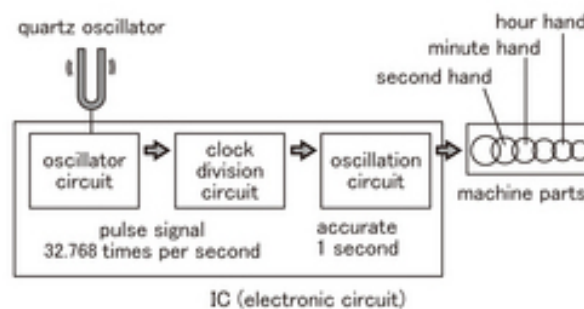


Fig. 2 Mechanism of quartz type clock

troublesome because it was one of the daily necessities. The Quartz type clock had been designed to make up for such faults. When the crystal is given the electric current, it vibrates by an extremely accurate value. In other words, the characteristics of expansion and contraction are used (Figure 2). This is called the piezoelectric effect.

The accurate movement of clock hands (clock accuracy) was guaranteed by this. Another issue of energy supplement was solved by using a battery instead. Since the electric current poured into crystal is very little, the consumption of the battery is very small. Thus, the quartz type clock solved two problems that the mechanical watch had by reducing frequency of the energy supplement and improving the accuracy.

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