

THE SONNERIE SOUVERAINE GRAND-STRIKE CLOCKWATCH AND MINUTE REPEATER

Full grand-strike functionality and operational safety protected by 10 patents

The grand-strike clockwatch is the most complex of horological creations. The greatest difficulty in its construction is to achieve full clockwatch capability from the limited energy in a wristwatch, without compromising on the sound and reliability of the chime.

In this watch, a single mainspring provides enough energy for 24 hours of grand strike (96 full chimes in passing), without using the minute-repeater. The chiming functions alone use up almost 60% of the main-spring's energy, and in silence mode without the chime, the movement is running for five days.

Constructing this movement has been a permanent search to save energy in maximising mechanical efficiency. The result is a low-tension movement with gentle mechanisms that have to be very finely adjusted to ensure unfailling chimes 35,040 times a year.

Operating a chiming watch has always been risky. If you do the slightest thing wrong, like setting the time while the chimes are ringing, you damage precious mechanisms.

Thus, the first entry in the specification book for this watch was: "make it safe to use by an eight-year-old child." I have to admit that the eight-year-old set me the toughest assignment of my career. To meet the demands, I had to construct a movement on new mechanical principles. In this piece, 10 patents underwrite the "Invenit" of this work of watchmaking art. The "Fecit" took me six years.

I'd like this watch to make you feel you can communicate with time itself. Above this illusion, I invite you to explore your new domain in carefully ready the instruction manual.

Each Sonnerie Souveraine is called by the name of its owner. Therefore, you give to your watch a purpose, an identity and a soul. Thank you for being its guardian.

François-Paul Journe

10 Patents for the SONNERIE SOUVERAINE

Barrel

A single barrel drives both the going-train and the strike-train from each end of the mainspring.

The barrel's drum, fixed to the outer end of the mainspring coil, has a toothed edge to drive the going-train. The barrel's arbor, fixed to the inner end of the mainspring, turns a toothed wheel that drives the strike-train through unidirectional gearing.

Power reserve indicator

A mainspring that unwinds both through the barrel and the arbor requires a sophisticated power-reserve indicator.

The power-reserve indicator has three coaxial differentials. The top differential forms the link between the arbor and the barrel. The lower differential moves according to the winding or unwinding of the arbor. A third differential forms the link between the first two differentials to show the mean power-reserve of the mainspring.

Winding and setting system

The compact winding and setting system does away with the long stem and sliding-pinion, and finds its place under the dial.

In this system, the crown-wheel is permanently meshed with the transmission-wheel mounted coaxially on a rocking arm. The winding-stem slides through a square in the centre of the crown-wheel.

The transmission-wheel drives intermediate-wheels for winding and for setting the time, mounted at either end of the rocking arm.

Pulling out the winding-stem makes the pullout piece pivot the arm to mesh the intermediate-wheels with the minute-wheel for setting the hands.

With the stem in the winding position, the torque produced by the winding action on the transmission wheel, swings the rocking arm to mesh intermediate wheel with the winding ratchet.

Strike selection

Controlled by a column wheel, the mechanism to select and indicate the strike mode performs its duties with the minimum of parts.

The rotating column-wheel acts on three levers: the lever to select grand strike or small strike, the lever to select silence and the sprung rocking-arm that indicates the selected strike mode on the dial via a rack and pinion.

Pressing the strike-select button makes rocking-arm lift the sprung pawl. The pawl pulls the 12-toothed wheel step by step to rotate the column-wheel through consecutive cycles of actions.

The striking racks

The construction of the movement, with the hours and minutes off-centre, allows the striking-racks to be mounted in the centre of the movement. This in turn makes possible outsize racks for greater precision and control.

The strike is governed by three coaxially mounted racks: for the hours for the quarters and for the minutes. Each has ratchet tothing to activate the hammers. When the strike is released, the racks drop on their respective cams. They are then immediately engaged by the strike-train and lifted to the end of their travel. As the racks lift, their outer teeth engage the gathering-pallets to strike the gongs. The distance each rack is lifted, thus number of teeth presented to activate the strike, depends on its starting point on its cam.

The strike sequence

The hours-rack has a toothed sector where it is engaged by the strike-train. The teeth are permanently meshed with a free pinion, rotating coaxially on the fixed pinion of the strike-train. To lift the rack, the rocking clutch-pinion engages the free and fixed pinions, locking them together, and transferring the drive from the strike-train to the rack.

When the clutch-pinion disengages, the sprung-rack brings the rack's finger down on the cam.

Strike release

Every quarter hour, a tooth on the star-wheel pivots the trigger against its spring to set in motion the chime in passing. The trigger acts through sprung levers to disengage the rocking arm from the pivoting clutch. This frees the pinion to allow the racks to fall on their cams. The spring then returns the rocking arm against the pivoting clutch (to re-engage pinion to lift the racks).

The minute-repeating strike is released by pressing button. The pivoting levers act on the rocking arm to disengage the clutch and allow the racks to fall.

Chiming gongs

This new design produces a louder, clearer sound from gongs that are just three-tenths of a millimetre thick. Mounting the gongs on the movement instead of around it increases the diameter of the movement.

The gongs for a chiming mechanism consist of a flat blade one end of which can be fastened to the structure of the watch. The free part of the blade is shaped so that its natural frequency is audible when its edge is struck.

Blocking the strike automatically

The chimes are automatically blocked to reserve the last 24 hours of the mainspring's energy to the movement.

A cam, working off the power-reserve differential, switches the pivoting lever when the power reserve falls to 24 hours. The blocking device keeps the clutch-pinion meshed with the driving pinions of the rack, thus preventing the racks from falling to start the chime.

When the power-reserve exceeds 24 hours, the cam releases the blocking mechanism, returning the pivoting clutch to the control of the rocking arm.

Blocking the strike and the winding stem

This safety system prevents the winding-stem from being pulled out when the strike is operating, and it blocks the strike when the stem is pulled out.

A locking-cam can be pivoted in two positions: one to block the manual strike-release button, the other to lock the winding-stem by acting on. Pulling the winding stem out pushes the lever to the left, pivoting the locking-cam so that it blocks the manual strike-release.

The locking cam is also switched by a pivoting sprung arm connected to the hours-rack. As soon as the rack moves to begin the strike, the arm pivots the cam so that it engages the stem-blocking device and prevents the stem from being pulled out to set the time.

SONNERIE SOUVERAINE - Technical Specifications

Movement:	Caliber 1505 Manually wound Gold baseplate and bridges 42 jewels
Movement dimensions:	Overall diameter: 35.80mm Casing diameter: 35.00mm Frame height: 6.25mm Overall height: 7.80mm Height of stem axis: 3.41mm Stem-thread diameter: S1.20mm
Balance:	Free-sprung 4 adjustment weights Flat Anachron balance-spring Fixed stud-holder Pinned stud Spring pinned to the collet Frequency: 21,600 v/h (3Hz) Inertia: 11.00 mg/cm ² Angle of lift: 52° Amplitude: Dial up, fully wound: > 340° Dial up, 24 hours: > 300°
Escapement:	Linear escapement 15-tooth escape-wheel
Visual indications:	Hours and minutes, off-centre Small seconds at 6 o'clock Power reserve Strike mode selection Striking hammers
Sound indications:	Grand strike, small strike on the quarters in passing Strike silent Minute-repeater on demand
Autonomy:	120 hours without chime Approx. 48 hours with grand strike Approx. 24 hours after strike runs down
Finish:	Circular grained baseplate Circular ribbing on the bridges Polished and bevelled screws Pegs with rounded, polished ends Steelwork decorated by hand 3D engraving
Case:	Steel Diameter 42.00mm Overall height 12.55 mm
Controls:	Two position winding and setting crown Pushbutton to release the minute-repeater at 2 o'clock Pushbutton to select the strike mode at 4 o'clock
Number of pieces:	Movements without dial 422 Cased-up, on leather 441 Cased-up, steel bracelet 558