

Watch innovation

Cycloidal reducer into automatic winding

The idea of integrating the cycloidal reducer in watch movements is working its way up. Revealed in 2011 it found its first application in the hour and minute display. This year it gets two extensions: the seconds display and, above all, a new automatic winding system for the mechanical watch. The obtained place and output gain opens new research possibilities for the watch designers.

Last year, the HE-Arc ingénierie professor Christian Robert and his students presented a project entitled "Cyclo watch complication" ("Complication horlogère Cyclo"). This study consisted in the integration of a cycloidal reducer – system which was only used till then in heavy mechanics – in a watch movement. The first project enabled to display the hour and the minutes. A model had been made and an animation presented. This watch innovation met a big echo in the specialised press.

This year, in his microtechnical conception course, Christian Robert has proposed his students two new projects where they must introduce the cycloidal reducer in watch movements.

The main objective is to replace one part of the gear wheels and pinions by a cycloidal reducer. These projects have been approached first by studying a clock-gauge and then validated by the construction of a model, whose different plexiglas parts have been cut with a laser machine.

Novelty Mechanism

One of the projects has enabled the conception of an automatic winding system for a mechanical watch thanks to a cycloidal reducer. It has nothing to do with the technological adaptation of an existing gauge, it is in fact the development of a new mechanism. The principle consists in modifying the automatic winding train of a mechanical watch by reducing the oscillating weight rotation frequency to wind the barrel. In this case, the oscillating rotor makes about 140 turns for a ratchet turn. The oscillating weight turns freely in one direction; when it changes direction, it pushes the cycloidal reducer.

In a manual winding the barrel can also be wound by the watch crown. Then the ratchet rotation will not push the cycloidal reducer so as to prevent it from rotating too quickly, which would provoke a premature wear. To avoid this problem, the modul contains a disconnecting gear: an axleless mobile which holds on a olive-shaped peg.

Place and Output Gain

For this project a three students team has led two joint studies: the

conception based on the dimensions of an ETA 2892 gauge and the 20:1-scale model implementation.

The students have brought to completion this hard work. Thanks to the implemented model, we can better visualise the mechanism; its design is a very good achievement.

Finally, the use of a cycloidal reducer fully minimises the number of wheels and pinions in the automatic winding thanks to its big reduction ratio. Thus, we get a place gain, on the one hand, – the wheels number has gone down from seven to three – and, on the other hand, an increased output of 20% between the oscillating rotor and the ratchet.

Cycloidal reducer displaying the seconds

The other project intended to retake the foregoing year conception where a cycloidal reducer diminished the minutes and hour display, and so, enabled to add a cycloidal reducer to show the seconds on the civil time.

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