~~Timepiece~~ Clock movement ~~with~~ having a balance-wheel and hairspring

The present invention relates to a timepiece movement, more particularly a movement comprising a balance-and-hairspring type regulator and an escapement.

Whilst the balance of a conventional balance-and-hairspring regulator is oscillating, the hairspring develops eccentrically owing to the fact that its centre of gravity is not on the axis of the regulator and is moving. This eccentric development generates large return forces between the pivots of the shaft of the regulator and the bearings in which they rotate, which forces furthermore vary in dependence upon the oscillation amplitude. These return forces disturb the oscillations of the balance and affect the isochronism of the movement, i.e., increase the rate variations in dependence upon the oscillation amplitude. To overcome this problem, the present applicant has proposed, in its patent EP 1473604, a balance-and-hairspring regulator whose outer turn of the hairspring has a stiffened portion arranged to make the development of the hairspring concentric.

However, it is known that the concentricity of the development of a hairspring is not the only factor which has an influence on isochronism. Mounted in a movement, the regulator is disturbed by the escapement which causes a rate loss. In fact, during the unlocking phase, the regulator is subjected to a resistant torque before the line of centres, and this causes a loss. During the impulse phase, the regulator is subjected to a drive torque firstly before the line of centres, which causes a gain, then after the line of centres, which causes a loss. Overall, the escapement thus produces a rate loss and this disturbance caused by the escapement is greater for small oscillation amplitudes of the balance than it is for large oscillation amplitudes of the balance.

The present invention aims to further improve the ischronism of a balance-and-hairspring regulator and to this end proposes a timepiece movement comprising a balance-and-hairspring regulator and an escapement co-operating with the regulator, the outer turn of the hairspring comprising a stiffened portion arranged to make the development of the hairspring more concentric, characterised in that the stiffened portion is also arranged to