

The Mechanics of Mechanical Watches and Clocks

Bearbeitet von
Ruxu Du, Longhan Xie

1. Auflage 2012. Buch. xi, 179 S. Hardcover

ISBN 978 3 642 29307 8

Format (B x L): 15,5 x 23,5 cm

Gewicht: 456 g

Weitere Fachgebiete > Technik > Technologien diverser Werkstoffe >
Fertigungsverfahren der Präzisionsgeräte, Uhren

Zu Leseprobe

schnell und portofrei erhältlich bei

The logo for beck-shop.de features the text 'beck-shop.de' in a bold, red, sans-serif font. Above the 'i' in 'shop' are three red dots of increasing size. Below the main text, 'DIE FACHBUCHHANDLUNG' is written in a smaller, red, all-caps, sans-serif font.

beck-shop.de
DIE FACHBUCHHANDLUNG

Die Online-Fachbuchhandlung beck-shop.de ist spezialisiert auf Fachbücher, insbesondere Recht, Steuern und Wirtschaft. Im Sortiment finden Sie alle Medien (Bücher, Zeitschriften, CDs, eBooks, etc.) aller Verlage. Ergänzt wird das Programm durch Services wie Neuerscheinungsdienst oder Zusammenstellungen von Büchern zu Sonderpreisen. Der Shop führt mehr als 8 Millionen Produkte.

Contents

1	Introduction	1
	References	4
2	A Brief Review of the Mechanics of Watch and Clock	5
2.1	The Verge Escapement	7
2.2	The Anchor Escapement	10
2.3	Graham Escapement	12
2.4	The Grasshopper Escapement	17
2.5	The Spring Detent Escapement	21
2.6	The Cylinder Escapement	26
2.7	The English Lever Escapement	30
2.8	The Swiss Lever Escapement	32
2.9	The Daniel Co-Axial Escapement	34
2.10	The Dual Ulysse Escapement	38
2.11	Concluding Remarks	40
	References	44
3	The Mechanics of the Swiss Lever Escapement	47
3.1	Introduction to the Swiss Lever Escapement	47
3.2	The Motion of the Swiss Lever Escapement	49
3.3	Dynamic Modeling by Impulsive Differential Equations	61
3.4	Modeling Using RecurDyn®	81
3.5	Experimental Validation Using Acoustic Signals	82
3.6	Sensitivity Analysis	85
3.7	Concluding Remarks	86
	References	86
4	The Mechanics of the Spiral Spring	89
4.1	A Historical Review of Spiral Springs, Hairspring and Main Springs	89

4.2	The Mechanics of the Hairspring	92
4.2.1	The Model	93
4.2.2	Computer Simulation.	98
4.3	The Effects of the Hairspring and the Tourbillon.	100
4.3.1	The Wave Equation for the Hairspring–Balance Wheel Assembly.	102
4.3.2	More Precise Description of the Hairspring Movement by Fourth-Order Differentials	107
4.3.3	The Case of Tourbillon	110
4.4	Concluding Remarks	112
	References	113
5	Automatic Winding Device	115
5.1	A Historical Review of the Automatic Winding Devices	115
5.2	The ETA Automatic Winding Device.	117
5.2.1	The CAD Model.	117
5.2.2	The Kinematics Model	119
5.2.3	Computer Simulation and Experimental Validation	125
5.3	The Seiko Automatic Winding System	130
5.3.1	The CAD Model.	130
5.3.2	The Kinematical Model	131
5.3.3	Computer Simulation.	134
5.4	Energy Harvesting Based on the Automatic Winding Device.	138
5.5	Concluding Remarks	140
	References	141
6	Gear and Power Transmission	143
6.1	A Historical Review of the Gear Train in Mechanical Movements	143
6.2	The Geometrical Model	145
6.3	The FEA Model and Simulation Results	146
6.3.1	The FEA Model for Bending Analysis.	147
6.3.2	The FEA Model for Contact Analysis	151
6.4	Misalignment Errors and Their Effects	155
6.4.1	The Description of the Misalignment Errors.	155
6.4.2	Loaded Tooth Contact Analysis	157
6.4.3	The Effect of the Misalignment Errors on the Contact Zone	159
6.4.4	Misalignment and Transmission Error	161
6.4.5	Misalignment and Torque Transmission.	162
6.5	Tooth Profile Modification	163
6.5.1	The Modified Tooth Profile	163
6.5.2	Tooth Profile Modification and the Contact Zone	165

6.5.3 Tooth Profile Modification and TE	166
6.5.4 Torque Transmission After Tooth Modification	167
6.6 Concluding Remarks	168
References	168
7 Concluding Remarks	171
Appendix: Computer Animation	175
Index	177