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INTERNAL WORM GEAR PAIRS

by

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Internal worm gearings are special worm gearings that are made up of a helical worm and an internal teething worm wheel. This is a relatively new gearing, which has occurred on an idea of working internal teething gears with helical worm hob.

The manufacturing of internal teething gears with helical worm hob was abandoned because of the geometrical and cinematic difficulties. However, at the internal worm gearings, the worm wheel is manufactured by a tool with parameters similar to those of the worm, and there is no need for the involutes profile, and thus it is much easier to manufacture.

The topic of the doctoral thesis is the presentation of internal worm gearings generally, the determination of gearing surfaces and field, the possibilities of working manufacturing, respectively.

The thesis has six chapters; in its introduction with a presentation of worm gearing development along their evolution.

The first chapter approaches the various worm gearings, also including their classification. At the same time, the chapter approaches various types of helical lines and surfaces, respectively the approximation of gearing surfaces with third degree Spline functions.

The second chapter presents the internal worm gearings, the various constructive solutions, the geometrical calculation and the modeling possibilities.

The third, fourth and fifth chapters are the basic chapters of the thesis that present the author's theses.

In the third chapter, there is a presentation of the complex mathematical modeling of the internal worm gearings, the mathematical methods for the determination of gearing surface, respectively.

The fourth chapter deals with the computer simulation, presenting the gearing field for various angles between axes and the worm wheel obtained from the gearing's equation, respectively. For programming and simulation, the AutoCAD and MathCAD software were used along with the AUTOLISP and Visual FoxPro programming languages.

The fifth chapter presents the manufacturing technology of the elements of the internal worm gearing. It presents the research outcome, the design of the special devices necessary to it, and the manufacturing of the helical worm hob. At the same time, it presents working methods providing different working methods also. It approaches a method of choosing working tools that improve the working possibilities for the gearing elements.

The sixth chapter presents the thesis conclusions, the author's theses, as well as the various research possibilities in future.

THESIS

- The author realized the mathematical model of internal worm gear pairs for an angle between 0 – 90 degree between the ax of worm and worm wheel. The worm's flank is generated by a straight line, which is also the division diameter of the wheel. He demonstrate by numerical analysis that, these gear pair analog like the CONE type globoid worm gears have two mating surface, one is in the middle plane of the worm wheel and the second in the exit part of worm with a direction nearly the worm ax.

- Analyzing the effects of variation of angle between the axis, he demonstrate that, for an angle between the axis between +/- 20 degree the contact surfaces are nearly similar with insignificant modification in comparison with the best situation when the axis are perpendicular.

- As technical result, it can remark the theory of tool choice; with this method the manufacturing devices are modified.

IMPORTANT PUBLICATIONS

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o	Siposs I. - Páy G.: *Belső csigás hajtások elemeinek gyártástechnológiája és szerszámai*. XIII-ik Szerszámgép Konferencia, Miskolc, 26-28 oct. 1998, Gépgyártástechnológia XXXVIII Évfolyam 11/ 1998, pp. 15-20.

o	Pay E. - Siposs I. - Páy G.: *Belsõ csigás hajtások matematikai modellezése*, A XIV Országos Géptervezõk és Termékfejlesztõk Szemináriuma, Miskolc, Hungary, 15.Dec.1998, Gép, IL. Évfolyam, 11 / 1998 , pp. 52-55.

o	Páy G. - Ungureanu N. - Coteþiu R.: *A belsõcsigás hajtások kapcsolási mezejének meghatározásához szükséges matematikai modellezés*. Kutatási és Fejlesztési Tanácskozás MTA Agrár Bizottság Ülése, Gödöllo, Hungary, 17-18 ian. 2000., paper no. 51.

o	Páy G. - Nãsui V.: *Internal Worm Gearing Elements Processing By Classical Machine-Tools*, Conferinta Internationala de Masini Unelte, ICMaS 2000, Bucuresti,octombrie 2000, Vol.40, pp. 101-106.