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HOBBING OF THE PLANE SPIROID WHEELS WITH THE FLY CUTTER

Vasile BOLOS, Ph.D, Professor, Codruța BOLOS, Ph.D, Professor
"Petru Maior" University of Târgu Mureş 540088- Târgu Mureş, str. N. Iorga nr. 1, ROMANIA, vbolos@upm.ro, cbolos@upm.ro

Abstract: *The paper emphasises kinematics of hobbing trough the milling procedure with fly cutter of plane spiroid wheels on the hobbing machine FD500.*
Key words: *Spiroid gearing, Hobbing, Fly cutter, Kinematic*

1. INTRODUCTION

The conjugated spiroid wheel used in worm spiroid gears with cylindrical (Fig.1) worm is plane and has the teeth placed on the frontal side. As a specific element, the active flanks of the worm teeth are in simultaneously gearing which makes the covering degree to be high and as a consequence the gearings loading capacity to be a little higher that in the case of classical geometry worm gearings.

Fig.1 *Spiroid worm gears with plane wheel*

The hobbing of the plane worm spiroid wheel can be done by milling with cylindrical hob on the FD500-U.M. Cugir hobbing machine or similarly using two working methods: axial advance or tangential advance [1]. In fig. 2 and 3 the two types of hobs whom should be used are presented.

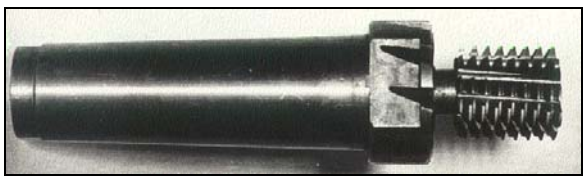

Fig.2. *Spiroid hob for axial advance*

Fig.3. *Spiroid hob for tangential advance*

The spiroid hobs have a complex geometry, having specific characteristics for each gearing (axial modulus, axial distance, transmission ratio) and imply high fabrication costs justified only by large numbers manufacture.

Having in mind the above considerations, for executing unique wheels and small number productions of wheels, the fly cutting use is a justified approach. In this case only tangential advance cutting is usable [2,3].

In the following article such a technology is presented, along with the specifics that occur.

2. GEOMETRICAL ELEMENTS OF PROCESSED WHEELS

To carry out the experimental program we have used wheels belonging to a spiroid gear with the following specific features: axial modulus m_a = 2.5 mm; z_2 = 47; the beginning number of the worm: z_1 = 1; the type of the worm: archimedic ; left side wrapping; the angles of the sides α_1 = 10º, α_2 = 30º; the axial distance A = 56 mm; the exterior diameter of the crown d_e=196 mm, the interior diameter of the crown d_i =143 mm, the height of the teeth h = 7,0 mm.

Fig.4. *Spiroid plane wheel manufactured with fly cutter*

For the experimental hobbing technology the materials used in the manufacturing of the wheels was cast iron Fc 250, with hardness in the piece 220 HB. Following the manufacturing process the wheels from Fig. 4 have resulted.

3. PROCESSING CONDITIONS OF THE WHEELS

The processing of the hobbing of the wheels was made through the milling procedure with the fly cutter, applying the method of the tangential advance on the hobbing machine FD 500 UM Cugir.

The relative working positions of the tool and of the semi-product, the movements needed for the generating process and the cinematic chains used are shown in Fig.5 and correspond to [1]

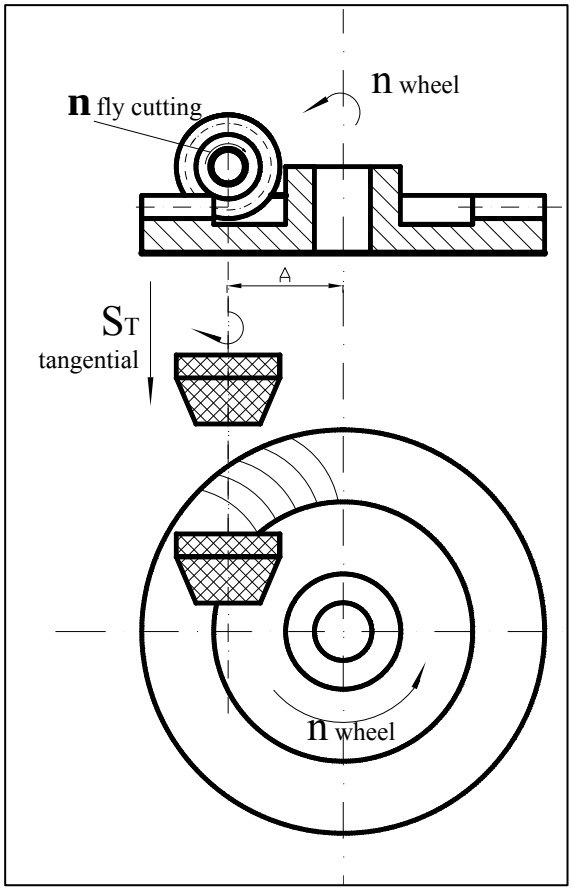

Fig.5. *Tangential advance manufacturing kinematics*

The movements done are the following:

- The fly cutter does the main splinting movement (spinning round its own ax) and the movement of tangential advance as well;
- The semi-product of the wheel does a spinning movement, which corresponds to the rapport of transmission between the fly cutter and the wheel.

The initial position of the fly cutter is outside the semi-product being fixed in the plane of the crown according to the plane tangent of the teeth bottom.

For the processing we used the fly cutter, whose construction and characteristics are presented in the Fig 6 and 7.

In order to determine the possibilities of hobbing of such processing we made hobbings with the features from Table 1.

Table 1. Splinting conditions used in hobbing

Splinting speed V [m/min]	Tangent advance S_T [mm/wheel rotation]
15	0,01

Fig.7. *Fly cutter working part detail*

Fig. 6. *Fly cutter*

During the hobbing the splinting process took place in good conditions: normal splints, lack of vibrations, normal heating of the tool and semi-products. As the semi-products used in the processing were made of cast iron, we did not use a cooling-greasing liquid.

Fig. 8 *Fly cutting lateral view*

Fig.9 *Fly cutting frontal view*

In 8 and 9 figure represent the image of experimental processing time.

4. CONCLUSION

- The processing of the plane spiroid worm wheels made of cast iron, on the hobbing machine FD 500 is possible in industrial conditions with fly cutter ;
- The manufacturing of fly cutters for the materialization of two beginning worms implies manufacturing complications related to the precision of the component elements positioning.
- The processing of these types of wheels in mass production demands the use of hobs.

5. REFERENCES

[1] BOLOŞ V., Angrenaje melcate spiroide. Danturarea roților plane (Spiroid worm gearings. The hobbing of the plane wheels-In Romanian language). Editura Universității Petru Maior Tg.Mureş, 1999, ISBN 973-99054-9-8, 264pag

[2] OVCINNIKOV, N.A., ZOTOV, B.D., Sposob narezania ploskogo zubciatogo kolesa. (Hobbing spiroid plane wheel-In Russian language) Brevet URSS nr.142135.

[3] NAPĂU I., Contribuții la studiul angrenajului melc-roată plană, Teza de doctorat (Contributions to the worm-plane wheel gearing-PhD Thesis, in Romanian language) Universitatea Tehnică din Cluj Napoca, 1998

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