

THE CINEMATIC CHAIN OF TWO CONTINUOUS AXES ROTARY-TILTING TABLE MRI 500-2 CNC AT THE MACHINE “CPFPH 1000-5 axes”

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ABSTRACT

Keyword: *Five axes machining.*

The horizontal machining centre moving table type CPFPH 1000 is one new generation machine developed by SC Stimin Industries SA Oradea in the years 2004. This is a three axes CNC machine with automatic horizontal/vertical milling head.

This machine is planned for modernization in the direction of the five axes machining in the next few months with the help of the Oradea University.

In this idea, the actual modular machine structure will be extended with new modules, in order to touch the proposed level of five axes machining.

These modules are: 2 axes milling head, 2 axes rotary-tilting table, new main spindle for higher speed, new ram compensation system, new electric installation.

All these modules were as separate modules, in order to permits one flexible structure at customer request.

INTRODUCTION

The horizontal machining center moving table type CPFPH 1000 is one new generation machine developed by SC Stimin Industries SA Oradea in the years 2004 from the bed milling machine class. This is a three axes CNC machine with automatic horizontal / vertical milling head. On the other hand, the machine is equipped with some options as follows: Automatic Tool Changer (tool magazine and hydraulic manipulator with double arm), rotary CNC table with the diameter of 800 mm as 4-th CNC optional axis, machine guarding system, pending panel, cooling installation, etc. as in **figure 1**.



Fig. 1 – CPFPH 1000 with H/V automatic milling head and CNC positioning rotary table, [1].

By the modernization, the machine will be equipped optionally with:

- 2 axes CNC head HD 320-2, or
- 2 axes CNC table MRI 500-2.

These options will be build as modular system, in order to offer to the customers flexibility and high technological level.

The actual one axis CNC table 800 mm diameter, is provided with positioning function only, and it can not be used in future as base in the modular system at the planed five axes machine "CPFPH 1000-5 axes".

Also it is necessary to develop one higher level for the table, MRI 500-2CNC, as two CNC axes table, for contouring milling operation at maximal power.

DESCRIPTION

The new table MRI 550-2CNC will be equipped with two separate AC servomotors, drivers, scales for position caption, blocking on both axes. The solutions for the feed mechanisms on rotary movements are adapted at the strong dynamic conditions for the five axes machining level regard: the stiffness, low hysterezis, zero backlash, high energetic efficiency, low friction, high torque, high mechanical ratio, irreversibility of the movements, high precision, absence of the stick slip, absence of the vibrations, etc.

The solutions analyzed are:

- Duplex worm-gear pair mechanism (**fig. 2**) manufactured by Stimin Oradea;
- Globoid worm-gear pair mechanism (**fig. 3**) from CONE DRIVE (USA);
- Small basic gear angle worm-gear pair mechanism (**fig. 4**) from OTT (Germany);
- Parallel feed mechanism with two parallel train of worm-gear pairs CONE DRIVE (USA) type (high precision hardened and grinded globoid worms), (**fig. 5**).
- MRI 500-2CNC rotary-tilting table, (**fig. 6**).
- Sample for MRI 630-2CNC rotary-tilting table, (**fig. 7**).

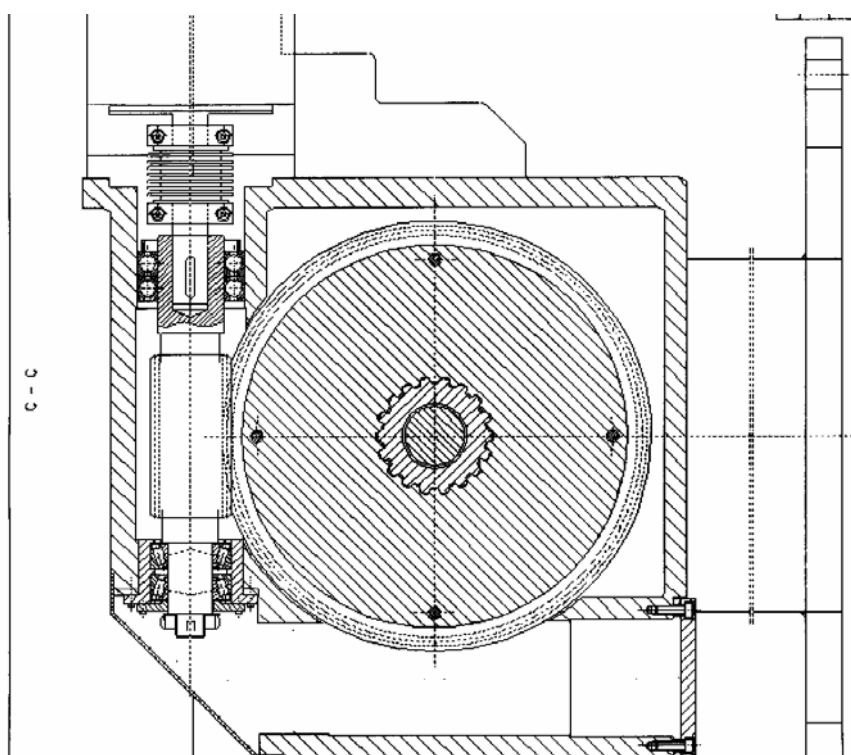


Fig. 2 – Duplex worm-gear mechanism

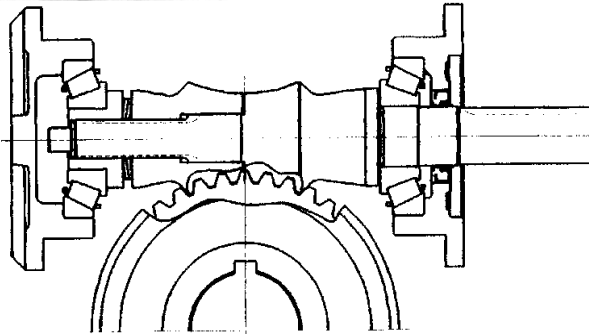
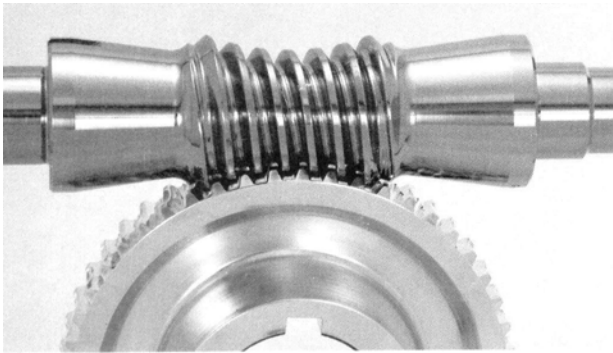


Fig. 3 – CONE DRIVE worm-gear pair, [2]

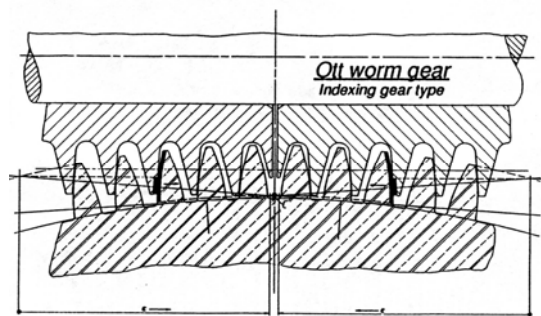


Fig. 4 – OTT worm-gear pair, [3]'

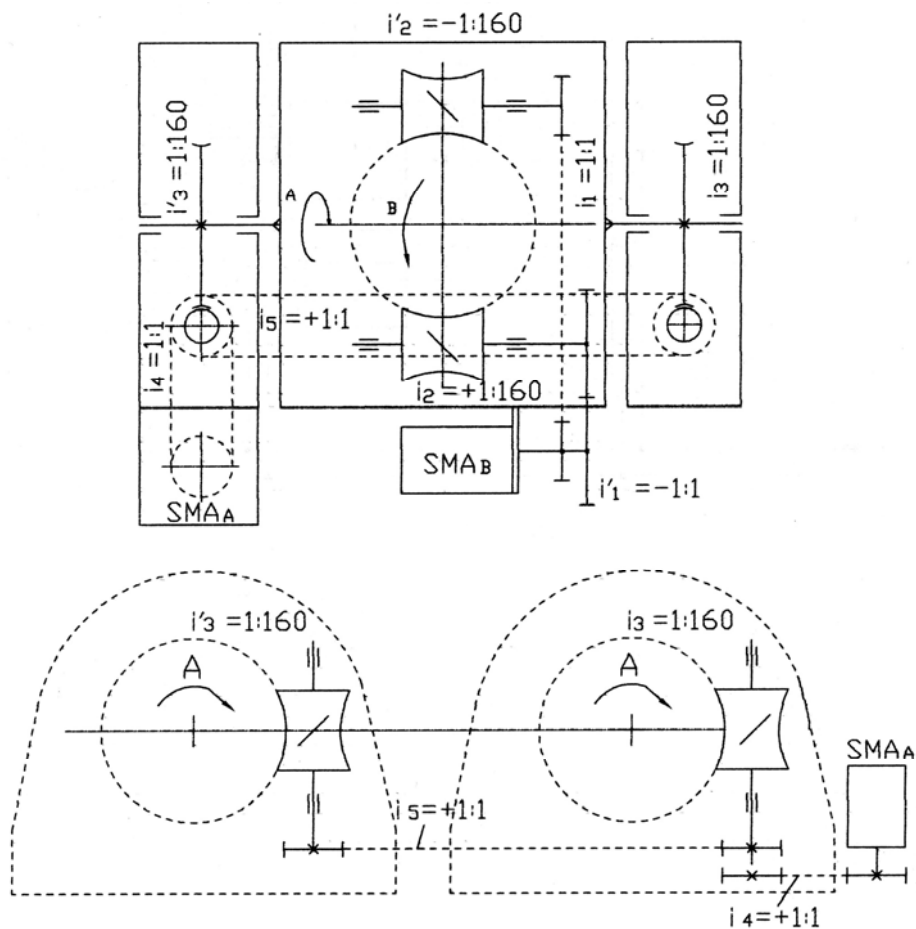


Fig. 5 – Cinematic chain with parallel feed mechanisms



Fig. 6 – MRI 500-2 CNC

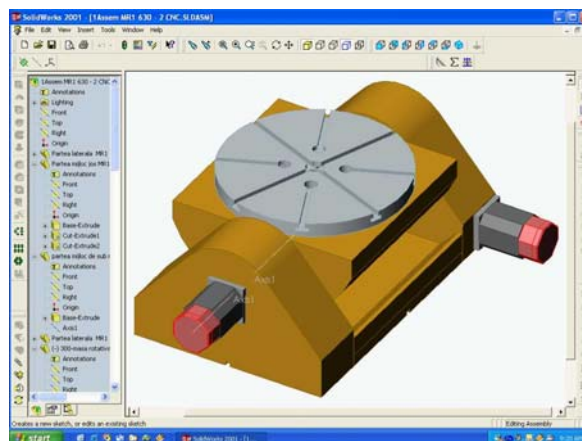


Fig. 7 – MRI 630-2CNC

CONCLUSIONS

The authors of the present paper work are working at the machine modernization, in order to obtain the variant of “five axes machining” on the Stimin’s representative machine CFPH 1000-5 axes”. At this project will be applied innovative solutions as parallel feed mechanisms for the rotary CNC axes with globoid worm & gear pairs from US, in order to assure the quality head conditions.

The table MRI 500-2CNC is a detachable module, which can replace the CNC 2 axes head HD 320-2CNC module, in order to obtain different variants of the machine structure on five axes machining principle, and all at the customer request.

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