

New solutions of "sprt" tool constructions for wood surface equalizing by face milling method

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Abstract: *New solutions of "SPRT" tool constructions for wood surface equalizing by face milling method.* Attempts to adapt new machining methods using self-rotating blade knives (SPRT) can also be recorded in wood processing. Intensive research has examined the possibility of using this type of tool during turning wood. At present, American companies have developed tools for metal milling operations based on self-propelled discs. Their adaptation for woodworking is the subject of this paper.

Keywords: SPRT tools, milling, new constructions

INTRODUCTION

In recent years, the interest in "SPRT" tools has been noticeable in metal machining: Self Propelled Rotary Tools [1,2,5,6,8,9]. The SPRT itself is caused by frictional forces that occur between the application surface and the cutting surface of the blade. The operating principle of the SPRT tool is shown in Figs.1 and 2. No rotating blade is the moment when the cutting edge is at an angle $\lambda_s=0$. If the edge is set at an angle $\lambda \neq 0$, then the blade itself is also affected by the friction of the chip moving on the attack surface.

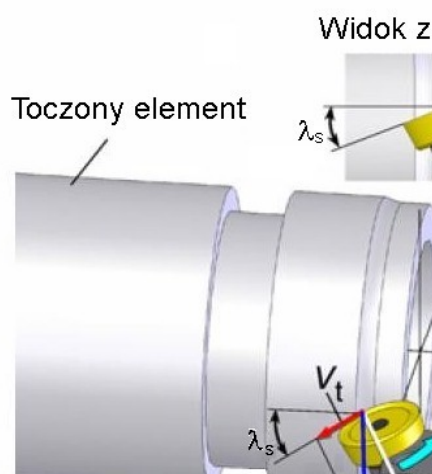


Figure 1. Principle of operation of SPRT tool with self-rotating blade

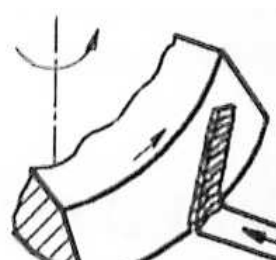


Figure 2. Self-propelled rotary tool

Attempts to adapt new rolling methods using self-rotating blade knives (SPRT) can also be observed in woodworking [10,11]. Intensive research has shown the possibility of using these tools in turning wood [7,8,9,10]. This is all the more understandable that similar types of fixed disc blades have been used for a long time in woodworking successfully in shaping due to: prolonged working time - longer cutting edge for dulling (4,5,11,12,13). Tools with self-rotating cutting blades are distinguished by a number of features highly desirable for cutting, such as increased blade life compared to fixed-blade tools or a

significant reduction in the temperature in the cutting zone, by a constant change in the position of the cutting edge of rotation. Also the possibility of using replacement blades is a great advantage of this type of solution. This is particularly evident in the tendency to construct tools with replaceable inserts on blades that are more resistant to dullness [9,10,11,12,13]. In the 1980s, Lockheed Corporation, in collaboration with Rotary Technologies Corporation, developed tools with rotary milling cutters (Figure 3). The commercial use of rotary tools began around the turn of the century. The intensification of the work on the SPRT tools was conducive to the efficient processing of hard-to-clean materials, especially the new variety of CGI (Compacted Graphite Iron) and nickel and titanium alloys (internal combustion engines, jet engines, chemical and medical equipment).

Significant role was played by the development of CAD / CAM systems supporting the construction and technology of these tools. Also advances in materials science and technological capabilities of today's CNC machine tools have enabled the production of milling tools for industrial applications at Rotary Technologies Corporation in the USA, and recently in the milling heads of PokolmFrästechnik GmbH & Co. KG.[1,6,7,].

As part of the study of unconventional cutting tools, it was decided to make a cutter with a set of four roller tools for leveling the planes. Its design was inspired by the solutions used in metal cutting tools.



Figure 3. Standard milling head based on self-rotating blades

MILLING TOOLS WITH SELF-ROTATING CUTTING PLATES

To test the use of a tool with self-rotating cutting plates it was decided to use Rotary Technologies' existing rotary milling head and tailor it to the cutting conditions of wood. The standard SPRT head (equipped with four interchangeable inserts with rotating plates (Fig.3) can be equipped with a smoothing plate mounted in a special cassette next to the rotary blades.

Cutting blades are made of tool steel with a blade angle adjusted for wood processing ie 40°. The blades were selected in the form of cups as can be seen in Fig 4 and 5. This was a gentle transition of the chips through the tool insert.

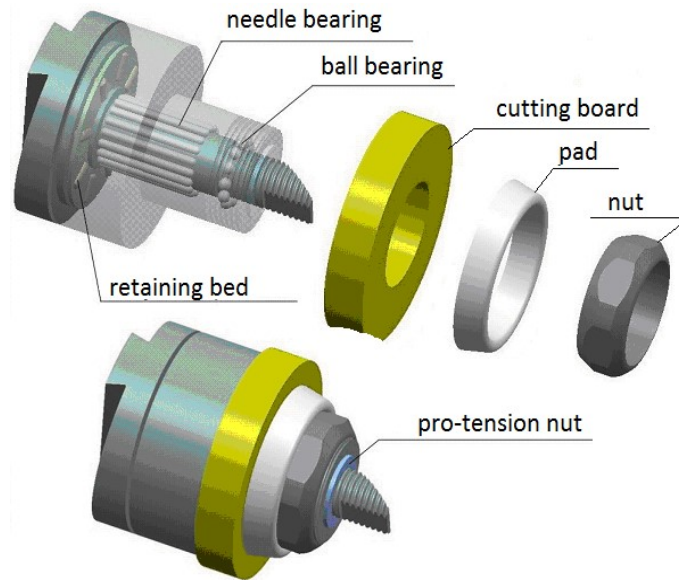


Figure 4. Model of the insert used in the construction of SPRT tools



Figure 5. Elements of blade inserts with fixing elements

Like the Mitsubishi Carbide turning lathe, needle and thrust bearings are used in the cassette and the entire system is pre-tensioned by the nut. It grips one more ball bearing to the rotating wall of the element on which the cutting insert is fixed (Figs.4, 5).

CONCLUSIONS



Figure 6. Tool insert with blade for wood

During the wood turning process, the edge of the cutting edge is applied to the workpiece. The result of the cutting process is the concentration of mechanical stress in the blade contact zone with the workpiece. This results in chip separation. The result of the cutting process is the molding of the milled surface.

Experience has shown that the construction and technology of turning milling tools for wood milling is much more difficult than conventional tools. The problems relate in particular to the bearing knots, the selection of the material for the tool components, the accuracy requirements of the individual parts of the tool, the high degree of assembly and the thermal effects of the cutting process.

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Streszczenie: Próby adaptacji nowych sposobów obróbki z zastosowaniem noży krążkowych samo-obrotowych (SPRT) odnotować można również w obróbce drewna. Intensywnym badaniom poddano możliwość wykorzystania tego rodzaju narzędzi przy toczeniu drewna. Obecnie firmy amerykańskie opracowały narzędzia do operacji frezowania metali oparte o płytki narzędziowe krążkowe samo-rotujące. Ich adaptacja do obróbki drewna jest tematem niniejszej pracy.

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