

**DESIGN OF THE MECHANISM OF THE PRODUCT TURNING IN THE
WOODWORKING MACHINE WITH CNC**

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Creation of unmanned aircraft (UAVs) is associated with the manufacture of wood technological sample for major elements of UAVs. General view of one of these samples - for the fuselage is shown in Figure 1.

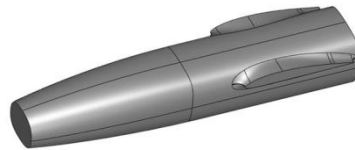


Figure 1 – Sample of UAV fuselage

During the work on the UAVs creation in SFU for processing samples a woodworking center with CNC was created. Three software-controlled coordinates are realized on machine (X, Y, Z). The machine has a frame structure (Figure 2). Operating device is a motor spindle mounted on the console slide (axis Z), which moves with ball screw drive on a track along the rolling (axis X) and transverse (axis Y) base machine.

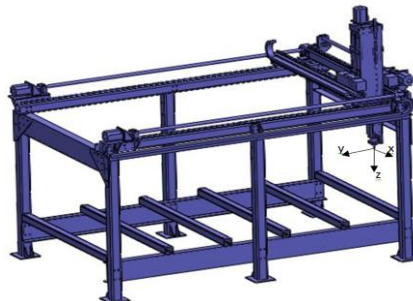


Figure 2 - Woodworking Machine

Increase of aerodynamic efficiency and other flight characteristics of UAVs require sophisticated geometry of the elements of its design, and, consequently, for processing samples - machines with many machining axes. To do this, you need to upgrade the machine by equipping it with mechanism of a product turning around the longitudinal axis.

Analysis of existing designs machines with turning mechanism articles about the longitudinal axis has shown that in most cases the product of the machine is installed at one end and attached to the cam holder and the other end products tightened by rotating center. One of these machines is shown in Figure 3.

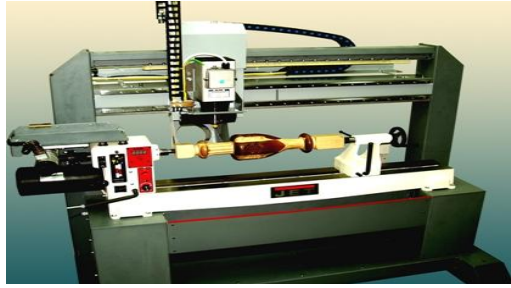


Figure 3 - The machine with mechanism of turning of a product

Requirements specification for the development of mechanism of a product turning was made. There are the main terms of requirements:

- turning rate of products 7,5 min⁻¹ (maximum);
- discrete of product rotation 0,6 angles in a minute;
- mass of the work piece 100 kg, not more;
- the length of the work piece 500 - 2500 mm;
- equipment product must be fixed in three-jaw chuck;
- rear rotating center has reinstalled on the length of the product.

There are high requirements for its dynamic characteristics. The mechanism for the rotation of products: self rotary and translational oscillation frequency of the product shall be not less than 50 Hz, and the amplitude of the oscillations in the treatment area - no more than 0.05 mm.

It is known that as the main parameter of the dynamic stiffness of the machine performs an elastic system MTTP machine - tool - tool - part. Rigidity of the system determines the strength and stability of vibration machine. In general, the rigidity - is the ratio of cutting force to the elastic displacement in the direction of the force.

The mass-inertial and elastic characteristics of its support and spindle groups and dynamic characteristics of the cutting process affects on the dynamics of the machine.

There are two subsystems, each represented by two coordinates: the subsystem of the work piece and the tool spindle subsystem. Both subsystems are loaded with cutting force.

The subsystem of the work piece included mass and moment of inertia of the work piece, the radial stiffness mechanism supports rotation of the work piece and the tensional rigidity of the drive rotation of the work piece.

In the tool spindle subsystem considered reduced mass and moment of inertia of the slider and the motor spindle (Z coordinate of the machine), and the stiffness of the mechanism moving the slider on the Y-axis machine, rotary stiffness of the slider.

Cutting force is determined by the characteristics of the work piece material and modes of processing.

In conclusion we'd like to say that the review of the milling machines with turning mechanism of the work piece to the norms and standards of their rigidity were made, reviewed the requirements for the product in the rotation mechanism woodworking CNC, designed for processing samples prefabricated UAV.