

Manufacturing of Z axis for CNC milling machine

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Abstract — The publication deals with the description of the production of the Z axis of the CNC milling machine. The necessary data for production were obtained from the prepared 3D design of the CNC milling machine. Parts production was prepared using the CAM softer Fusion360. After the production of parts, the equipment was completed and tested.

Keywords — CNC machine, Z – axis, Stepper motor, CAM system

I. INTRODUCTION

The main goal of the described project is the general maintenance of CNC equipment. The components from the Z - axis of the device were so worn out that they affected the accuracy of the manufactured parts by the CNC device. In the first solution of the problem, a 3D model of the whole mechanism of the device axis was designed. A detailed description of the 3D design and visualization was recorded in publication [1]. The next part of this publication focuses on the design of production using a CNC milling machine. The production of individual parts consists in the Generation of a G-code for a CNC machine and the completion of the Z-axis construction.

II. 3D DESIGN

When creating a 3D design, the Z-axis storage dimension was considered. Other reference parameters were the dimensions of the components used. The new Z-axis consists of a ball and nut SFU1605, which is stored in supports BK12 and BF12. The guide is realized by linear guide rails HGR20linear square rail and 4 pieces of HGH20CA slides carriage.

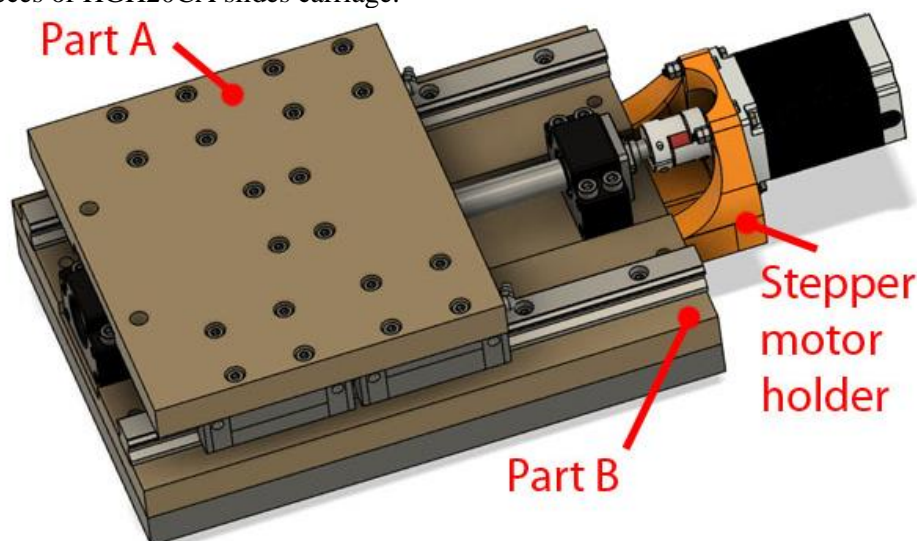


Fig. 1 1 The complete 3D design of the Z-axis of the CNC milling machine

All standardized parts were imported from available 3D model sources. The 3D design of the system was created in such a way as to ensure the greatest possible rigidity of the structure about the manufacturability of the parts. Figure Fig. 1 shows the complete design. The parts that needed to be designed and manufactured include part A, part B and stepper motor holder. The design of the stepper motor holder was adapted to the production technology using a 3D printer.

III. DESIGN OF PRODUCTION IN CAM SOFTWARE

Using a CNC milling machine, it is necessary to produce two parts, which are shown in Fig. 2 and Fig. 3. The machine with which the parts are produced is controlled by LinuxCNC software. The generation of G-code to produce components was provided by the Fusion360 software. The first part shown in Fig. 2 serves to attach the spindle holder. This work had to be machined from both sides.

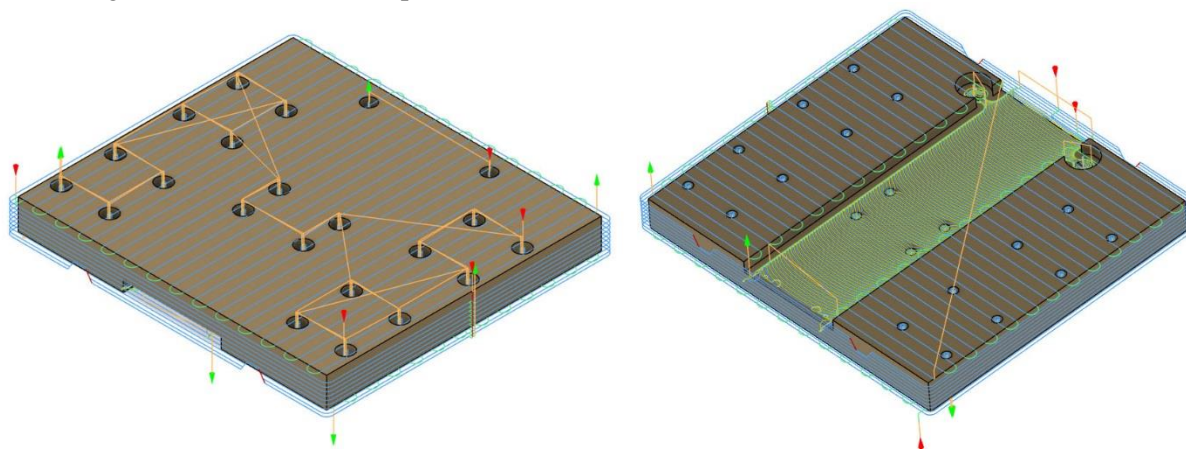


Fig. 2 Design of the production of the top part from the CNC Z - axis

Another component is the component shown in Fig. 3. The production was carried out on one workpiece clamping. Two tools were used, 8mm and 3mm milling tools. The first tool was 8mm milling tool which was used for roughing and finishing work. It ensured surface treatment, alignment and cutting of the workpiece. Another type of operation was cutting holes for M5 and M6 threads. Those holes were created by the Bore Mill strategy, thus ensuring the possibility of using the same tool to create holes with different diameters. Part detail and visualization of the generated code is shown in Fig. 3.

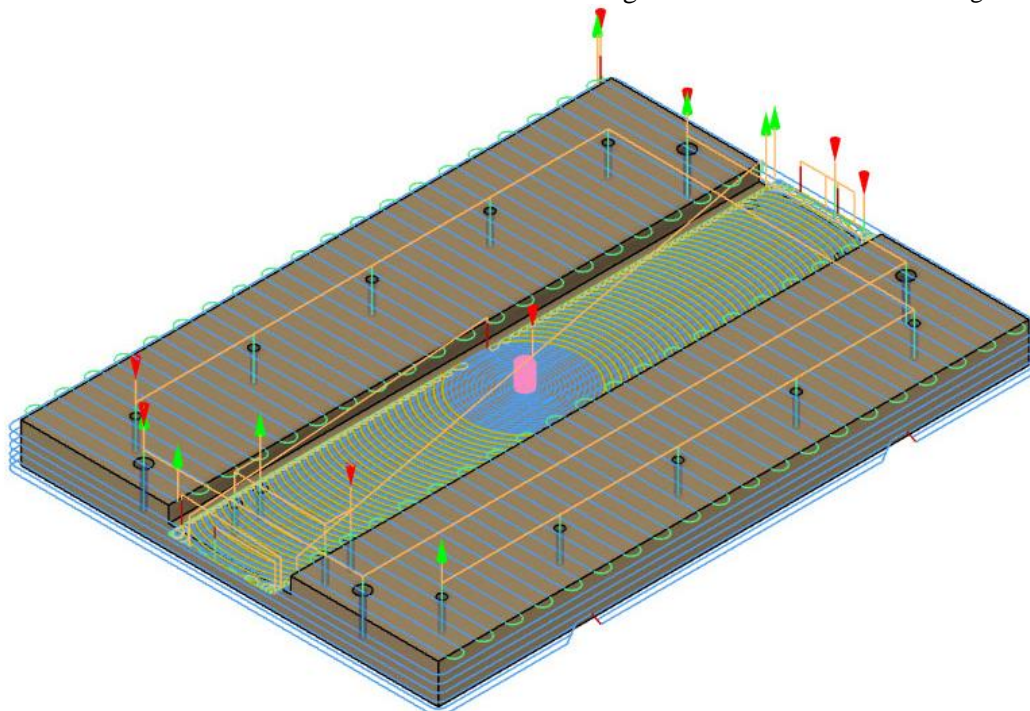


Fig. 3 Design of the production of the lower part of the CNC Z - axis

IV. PRODUCTION AND ASSEMBLY

After creating all the parts using a CNC milling machine, the threads were cut into specific holes. Subsequently, the components were completed. All parts have been assembled. Fig. 4 shows the assembled device that serves as the Z axis of the CNC device.

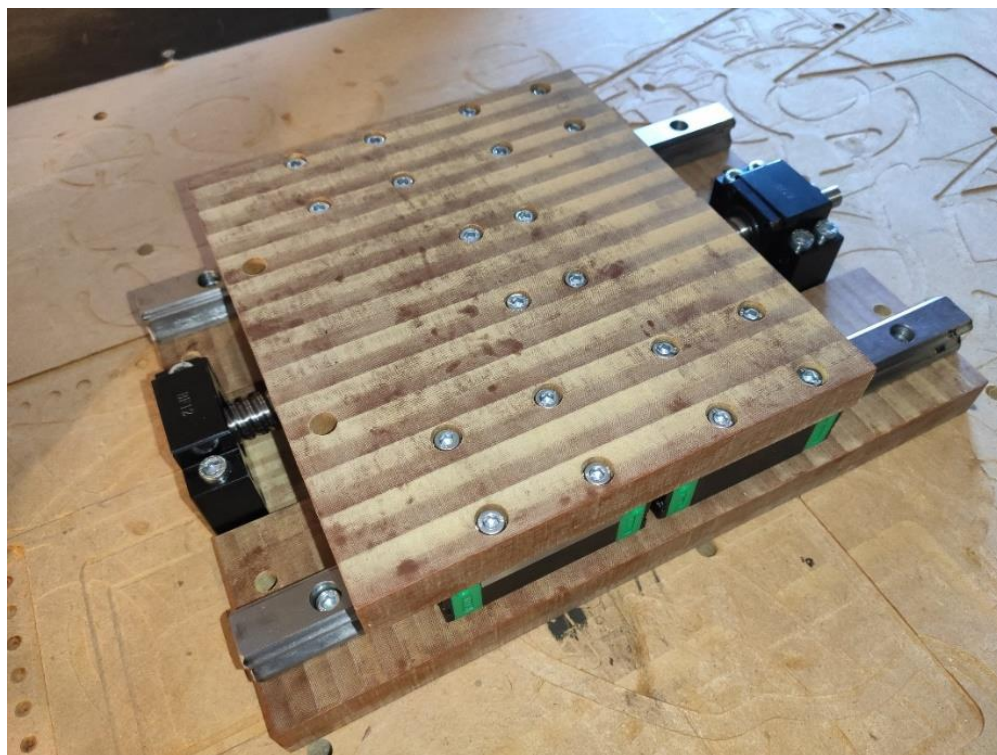


Fig. 4 Assembled Z - axis of CNC milling machine

V. CONCLUSION

After the creation of 3D models, the production of parts was designed. Production was designed in Fusion360 software. By cutting out the parts and manually cutting the threads, all the necessary parts for the CNC axes were completed. Subsequently, the Z - axis was completed. The parts moved smoothly. As a last part, it is necessary to make a holder for the stepper motor. This component will be manufactured using a 3D printer.

REFERENCES

- [1] Fecko B., Vince T.: Design of Z axis for CNC milling machine. Vol. 5, Issue 3 (2021) Journal of Industrial Electrical Engineering, Vol.3 (2021), Issue 3, pp: 8-10, ISSN 2454-0900
- [2] J. HOMIŠIN, Základy konštruovania v strojárstve. Košice : C-PRESS, 2009. 432 s. ISBN 978-80-970264-2-4H.
- [3] P. P. Song, Y. M. Qi, and D. C. Cai, "Research and Application of Autodesk Fusion360 in Industrial Design," IOP Conference Series: Materials Science and Engineering, vol. 359, p. 012037, May 2018, doi: 10.1088/1757-899x/359/1/012037.
- [4] J. Balic, "Intelligent CAD/CAM systems for CNC programming—an overview," Advances in Production Engineering & Management, vol. 1, no. 1, pp. 13–22, 2006.