3D Printing in the Automotive Industry

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Abstract. The article presents the implementation of 3D printing in the automotive industry. According to a report by automotive research company Smart Tech Publishing, 3D printing is increasingly being used to produce automotive parts. Analysts predict that by 2029, the printed parts market will generate up to and over USD 9 billion. The authors of the article present the process of designing and making a functional cup holder replacing the existing factory one.
The 3D-printed cup holder provides car upgrades by providing space for a smartphone, coins and power cord. The realized cup holder is resistant to varying temperatures during different seasons and is characterized by stable mechanical parameters.

Keywords:3D printing, automotive, cup holder

1. INTRODUCTION

The automotive industry faces the following challenges from building better, new and perfectly performing vehicles, to optimizing production, supply chains and logistics. One of the technologies that helps her cope with these challenges is 3D printing. With each passing year, 3D printing finds increasing application in the automotive industry, allowing designers and constructors to meet consumer expectations (Redwood et al., 2017; Yang et al., 2021).

The days when the primary use of 3D printing technology in the automotive industry was rapid prototyping are long gone. Today, automotive companies are increasingly using 3D to print automotive parts and custom car models (Wild., 2019; Jha, 2019).

The authors of the article share their experience in designing and making a functional cup holder aimed at replacing the factory one, providing a place for a smartphone and additional space for coins and a power cord.

The implemented project is free for all, which allows teachers and students to customize and extend its functionality.

2. DESIGNING THE COMPONENTS OF THE CUPHOLDER

The design platform for the cupholder details is Blender because this software provides efficiency, flexibility and security that are critical to the successful execution of engineering projects and improves team collaboration. (Torta et al., 2018; Naik, 2020) Focused on the selection of a suitable material - PLA filament, as it is suitable for functional prototyping and production of parts characterized by high impact resistance (Gebhardt et al., 2018).

The design is carried out in the following sequence:

- Cutting out a phone stand.

After creating a rectangular cube measuring 9 cm / 2.6 cm, the sides are beveled and with a bullion operation, an angle cut is made so that the smartphone screen faces the driver or passenger - Fig. 1.

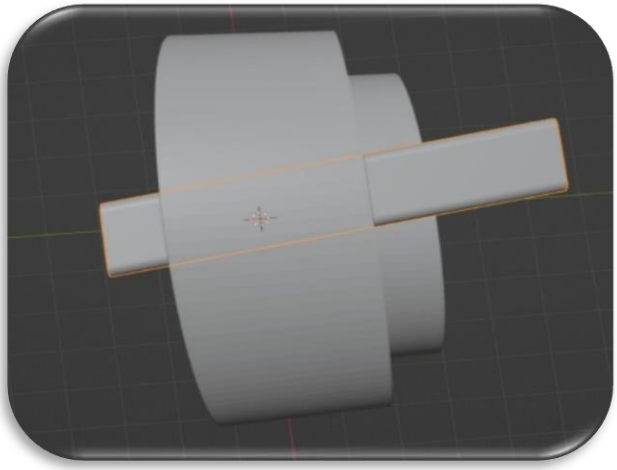

Fig. 1 Cutting out a phone stand

- Coin compartment cutout

A cylinder is created that is cut almost in half by selecting the vertex points and deleting them. We scale the lower part of the shape. a bevel operation was performed on the sides to achieve rounded shapes without right angles. With a bullion operation, the shape is cut on the cup holder - fig. 2.

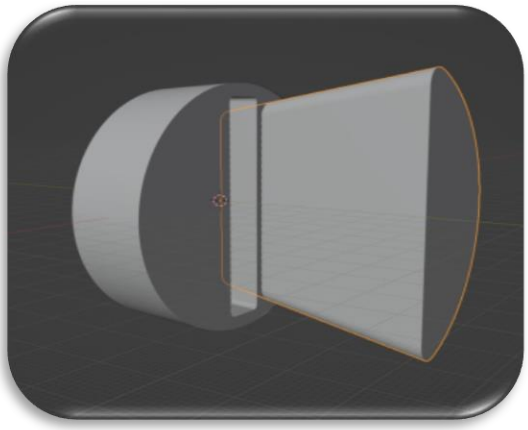

Fig. 2 Coin compartment cutout

- Cut space for cable

A cylinder with a diameter of 1.3 cm is created suitable for cables, a pen or other cylindrical objects. With bullion operation, an incision is made in the design of the cupholder - fig. 3.

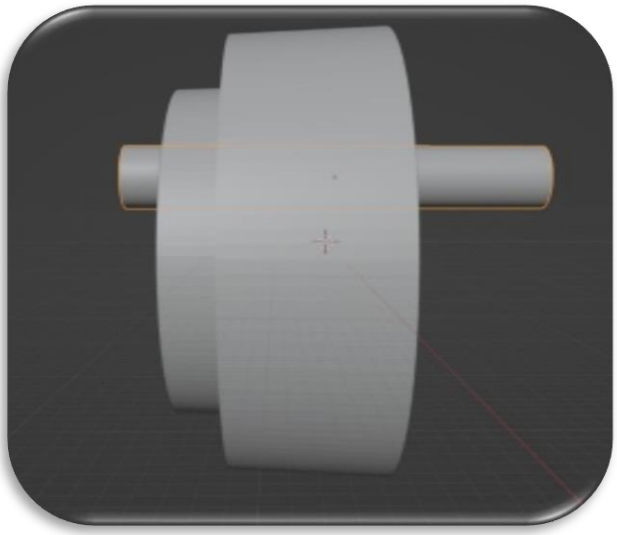

Fig. 3 Cut space for cable

The front part of the finished model is shown in fig. 4.

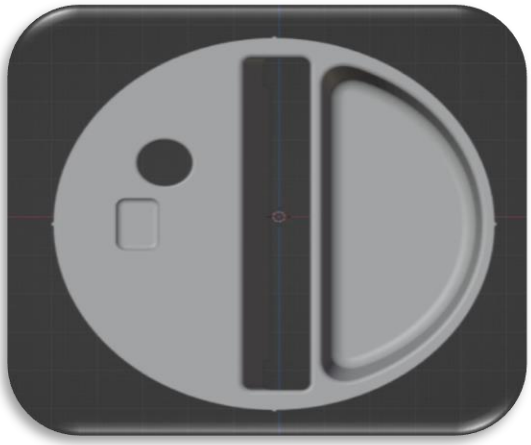

Fig. 4 The front of the finished model

3. 3D PRINTING OF THE COMPONENTS OF THE CUPHOLDER

3D printers are a revolutionary technology that is changing the way a variety of products are designed, developed and manufactured.

The Bambu Lab X1C 3D printer was used to print the cup holder components, which provides unparalleled precision, speed and flexibility. It features functionalities that open up a wide range of opportunities for innovation in engineering education.

The 3D printing software “Bambu Studio” was used.

After preparing the software and the filament, a support is placed on the model because there are hanging parts.

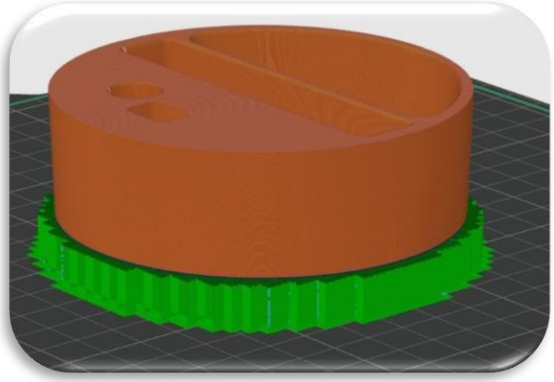

Fig. 5 Cup holder with support

The finished product is shown in the following figure.

Fig. 6 Finished product

4. CONCLUSION

The 3D-printed cup holder provides car upgrades by providing space for a smartphone, coins and power cord. It is resistant to varying temperatures in different seasons and is characterized by stable mechanical parameters.

The implemented project is free for all, which allows teachers and students to customize and extend its functionality.

3D printing makes it easy to make improvements to the design of the produced cup holder. If it is necessary to change some features (for example, to adapt it to a different car model), this can be done by changing the 3D design. New departments and components can be added to extend the functionality of the cup holder. The proportions and shape of the cup holder can be changed to improve its performance or aesthetics.

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