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DEVELOPMENT OF A HIDDEN BLADES FAN PROTOTYPE – CASE STUDY

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The prototype of the bladeless fan consists of:

The theoretical part of the design

- Basic terms and definitions
- Prototype
- Modeling
- Construction

The practical part of the production

- Creation of 3D models (virtual prototype)
- Creating a physical prototype
- Prototype analysis

Basic concepts

PROTYPE

- A prototype is the first, original form of a product or a part of it in an appropriate form intended for various forms of testing and use.
- Prototyping can improve product knowledge at almost all stages of the process.
- From the point of view of appearance, we distinguish between virtual and physical prototypes.
- Construction is the creative activity of thinking through a wide variety of systems.
- 3D modeling is the process of creating a mathematical representation of a three-dimensional object.

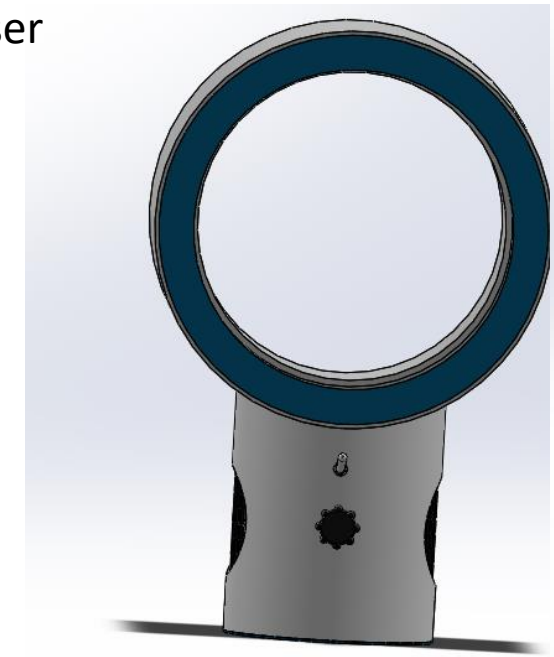
To arrive at the prototype it was necessary to design the product

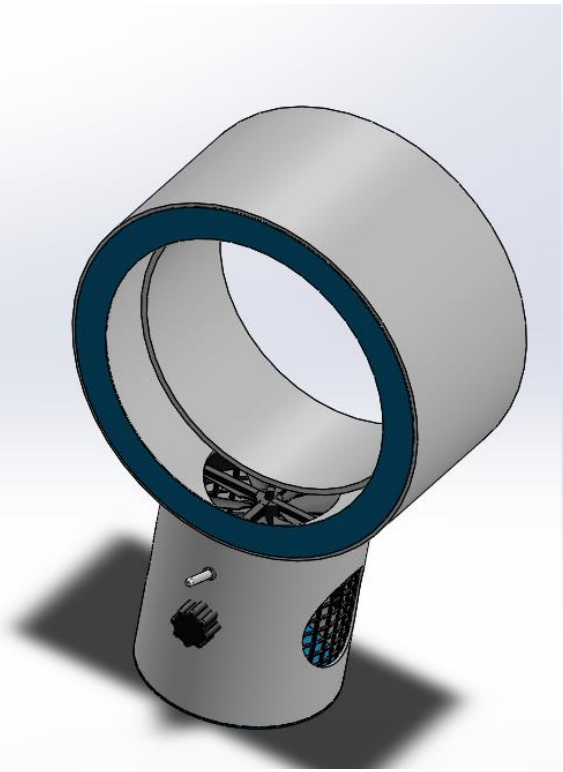
It was necessary to:

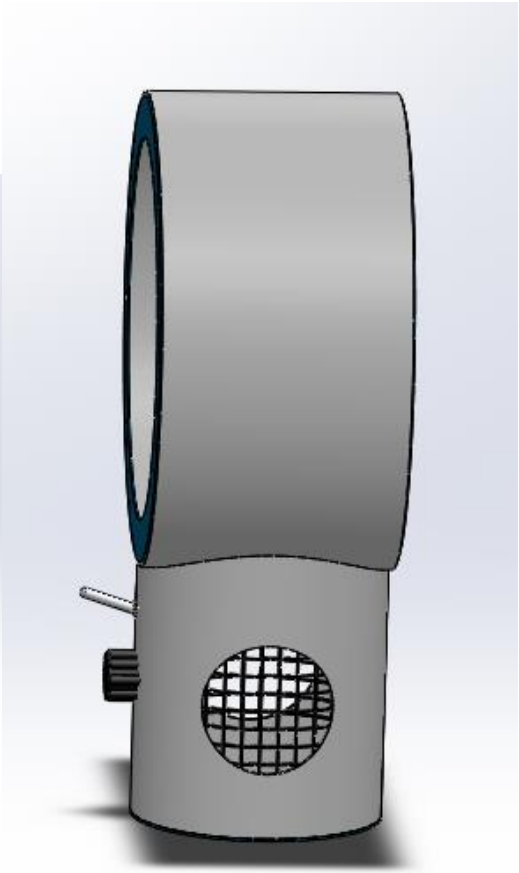
- make a literature research, search Internet sources in order to find the function, appearance, dimensions and materials of all parts,
- first make rough sketches of all parts and assemblies,
- make 3D models of all parts and assemblies, adjusting sizes and dimensions,
- make technical drawings of parts,
- build all the parts and assemble them to create a physical prototype.
- analyze the physical prototype.

3D model and virtual prototype.

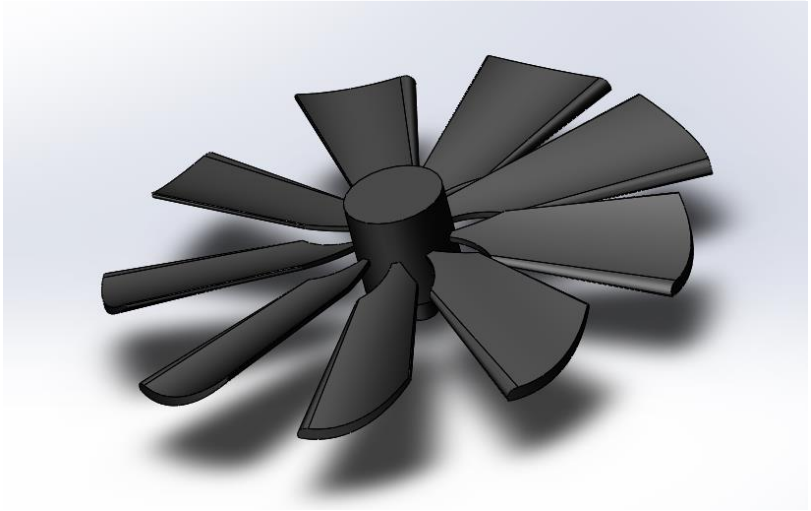
Basic parts of the fan:
-external assembly
-small fan
-two rings
-net
-switch
-dispenser

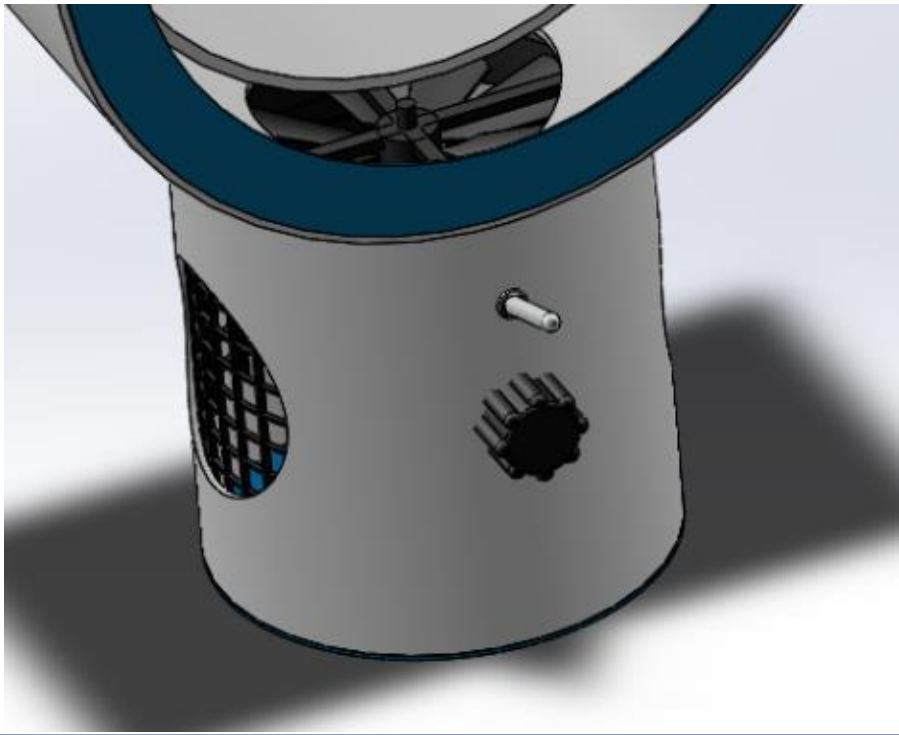




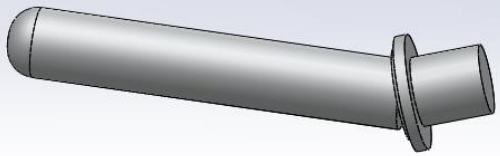


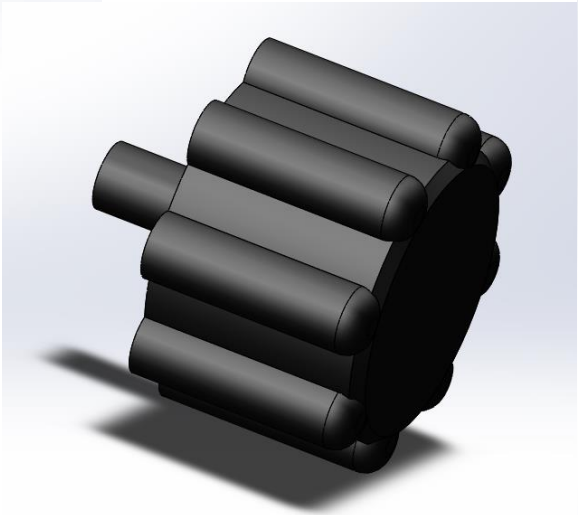
A small fan with a pad is inserted into the lower part of the outer assembly

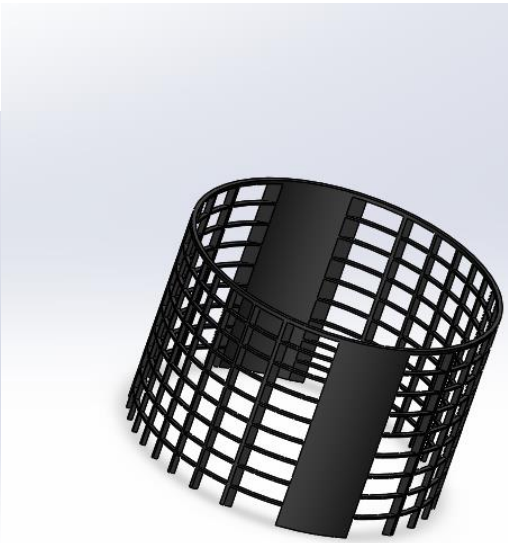




The switch and dispenser are located on the outside, and the net is inside the outer assembly



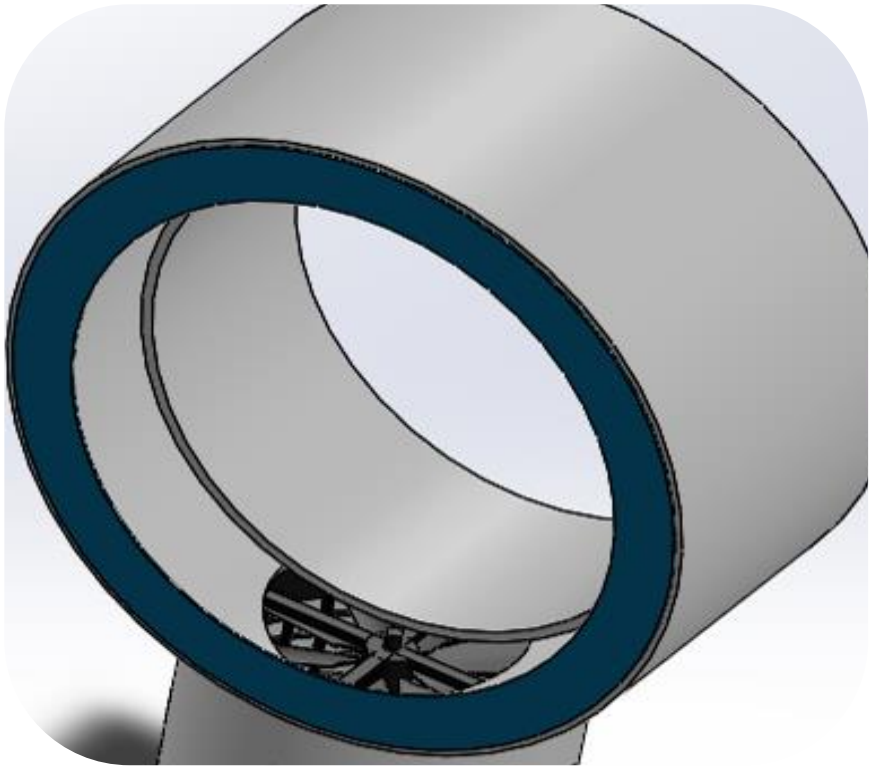




Working principle:

- There is a motor that drives the blades In the lower part of the fan.
- The air is sucked in from the bottom through the holes, which is then expelled to the other side through the upper part of the fan.
- The motor is hidden in the center of the fan.

Upper part of the outer assembly



Creating a physical prototype

During the creation of the physical prototype, it was necessary to make some changes compared to the 3D model for easier production and the functioning of the fan.

The first stage of production

The first stage is to insert a small fan into a 10cm pipe. The fan has an electric motor that drives it. The power of the motor is 15W, and the voltage at which it operates is 220V.

The second stage of production

The fork serves as the outer frame of the fan. The next step is to insert the Φ10cm pipe into the upper part of the fork with Φ12cm to make space for the airflow. The pipe is fixed by means of a bypass with a diameter of 12cm and 3 screws.

The third stage of production

The last step when making a fan is to drill a hole in the lower part of the fork, so that the fan can pull air, and install a net for a nicer appearance of the fan.

Analysis of the physical prototype and possible suggestions for improvement

- This physical prototype fan has its advantages and disadvantages.
- Advantages:
- it is very easy to use, easy to transport and performs well for the purpose for which it was intended.
- There are some suggestions for improvement:
- Instead of a fork to use some two pipes, because in the event of a failure of a small fan, this entire made fan would have to be disassembled, and if it were two pipes that are connected, it would not be a major problem.
- Tools used for the prototype production are not entirely precise. We would get a better quality of this prototype and appearance by using some precision machines.

Conclusions

- Before making a physical prototype, it is very useful to create a virtual prototype, in order to look at all the parts, the possibility of their installation in the assembly. Various analyses can also be done here:
- analysis of the material parts, mass, weight, economic analysis of production and assembly and so on.
- When a virtual prototype is created, it is much easier and clearer to create a real, physical prototype.
- If it was intended to go into the production of such fans, in addition to eliminating the listed defects, it would be necessary:
- develop a technological manufacturing process for each non-standard part (e.g. plastic injection molding technology, as most parts are made of plastic),
- analyze the possibility of sourcing raw materials,
- Analyze and design the assembly process and perform other analyses (e.g. production costs).