

Project 4: Group Project Paper Towel Dispenser

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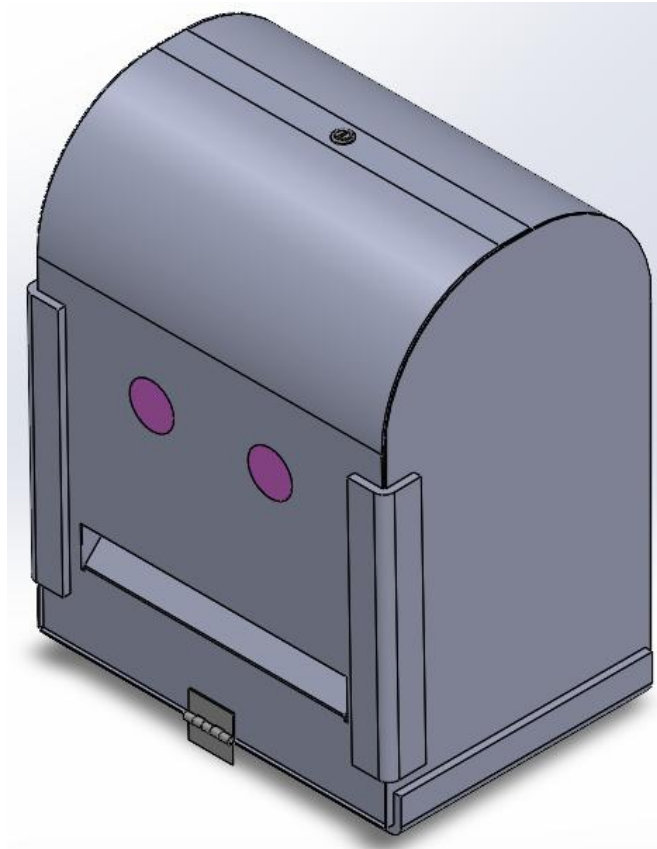
MECH 518: Design for Manufacturing

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Introduction

The purpose of this part was to be the housing of a paper towel dispenser. The housing was designed to be sturdy, rugged, and not accessible to the dispenser user. It is to be accessible to users that must change the paper towel rolls, but no internal components should be accessible to those without a key. The internal components include rollers, electronic parts, and paper towel holders; the housing must accommodate all these parts. The housing would mount to the wall using the holes on the back part, as seen in Figure 1. The housing assembly consisted mainly of two sheet metal parts, with plastic machined parts added for safety, a hinge, and a keyhole. The design began with a sheet metal base flange of 11-inch height, 11.64-inch width, and .0394 in thickness, which fit the parameters and has sufficient strength. The size was made as large as possible while fitting the constraints to allow for sufficient space for the other team members to fit their sub-assemblies. The material used was stainless steel, which is optimal for this application because it is corrosion resistant and paper towel rolls are often found in bathrooms, where they get wet. After the formation of the initial rectangle, material was added using bends to accommodate for the requirements, then holes were placed. All holes were 0.5 inches in diameter with a tolerance of .005 inches.

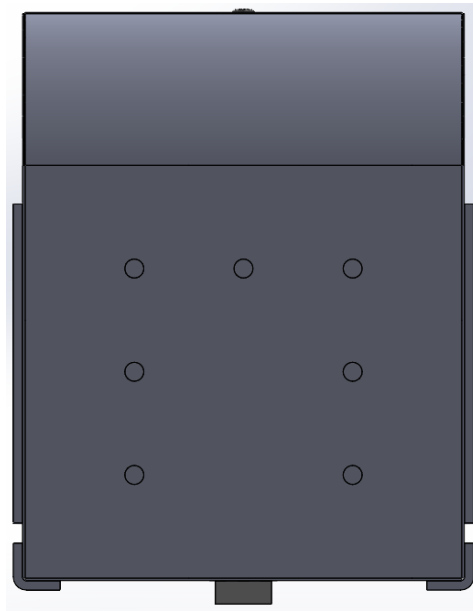


Figure 1: The mounting holes on the back of the housing.

Parts

All design alternatives were a decision. This section will detail each part of the housing assembly. All design decisions strictly followed the parameters necessary for structurally sound.

For the front facing part, as seen in Figure 2, the immediate notice is the two extruded circles. These hold no mechanical value and are strictly for visual appeal, as the design requirements discuss. The face-looking part makes this design unique, creative, and fun. Initially,

the hole towards the bottom of the part included teeth. However, these teeth were taken out because they were sharp and dangerous. Alternatively, there is a sharp edge inside of the top of the mouth which is less likely for a user to scrape the hand on it as they grab a paper towel. This allows the user to manually tear the paper towel from the machine without danger. A zoomed in picture of this edge can be seen in Figure 3. On the other hand, the bottom part of the mouth includes a sloped edge, as seen in Figure 4, which allows for the paper towels to be dispensed smoothly. The top hole is for the cam lock, as discussed in a following paragraph. The flattened part can be seen in Figure 5, including the bend lines and holes for manufacturing.

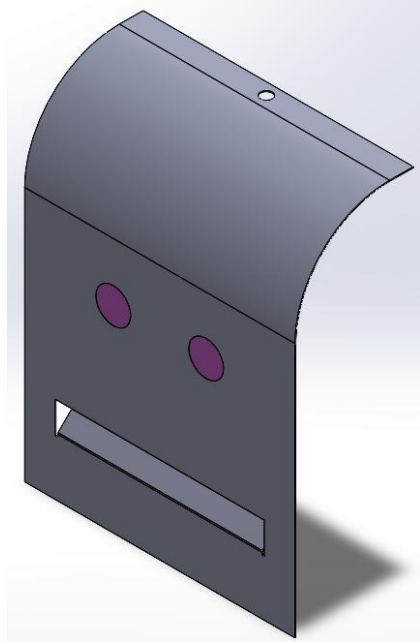


Figure 2: Front facing part.

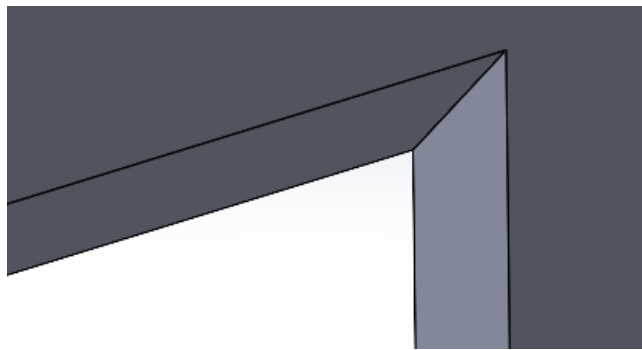


Figure 3: Sharp edge on the top of the mouth.

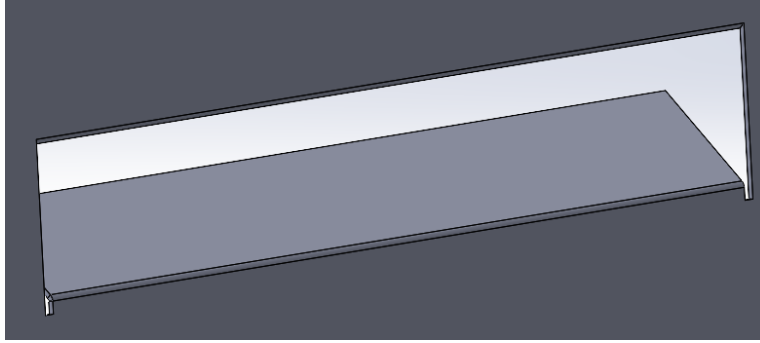


Figure 4: Sloped edge on bottom of mouth.

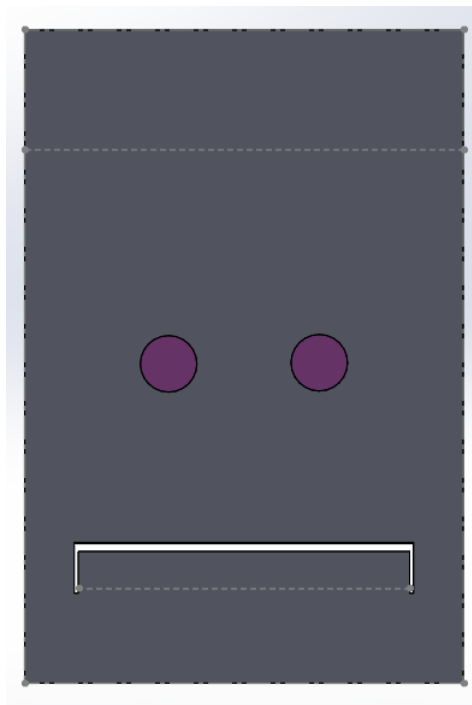


Figure 5: Flat front facing part.

The back facing part, as seen in Figure 6, was also made using sheet metal. This part consisted of more bends and edges than the previous part. It includes an arched roof with a radius of 4.02 inches that can fit a paper towel roll. Like the previous part, it includes a hole at the top to fit the cam lock. This hole aligns and attaches the front and back facing parts together. The hole at the bottom, as seen in Figure 7, is for a sensor. The sensor sees an object moving in front of it and will tell the dispenser to turn. The sensor is not displayed in this assembly but is attached to the main assembly with the electrical parts. The flattened part can be seen in Figure 8, including the bend lines and holes for manufacturing.

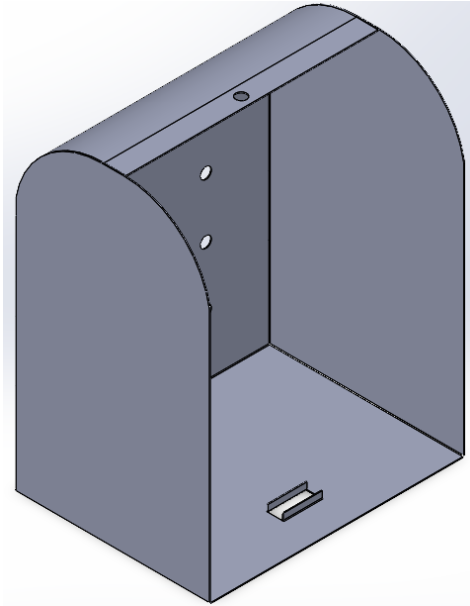


Figure 6: Back facing part.

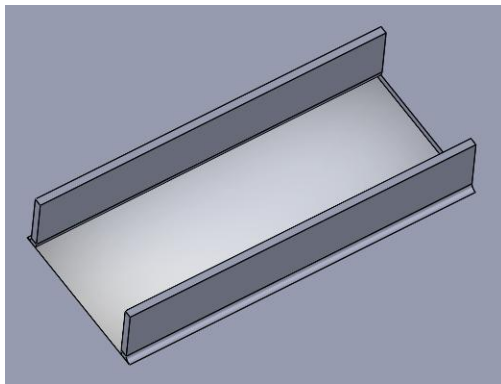


Figure 7: Sensor hole.

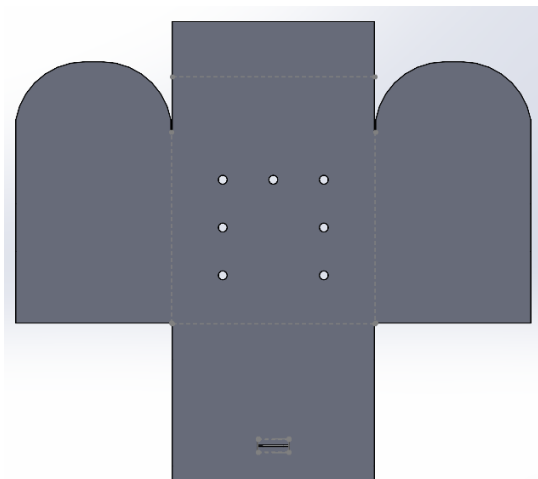


Figure 8: Flat back facing part.

The side corner part, as seen in Figure 9, is on the housing assembly four times. The main purpose of this part is to minimize danger on the housing. Without the part, the housing would include sharp corners that could be dangerous, especially for children or a wet environment like a bathroom. A secondary purpose of the part is alignment and attachment of the front and back facing parts. These parts are made from ABS plastic, which is safer than the stainless-steel metal from the sheet metal parts. Further, they are designed to be machined. They are 8.5 inches long to keep consistency throughout each of the four parts on the assembly. They are attached to the rest of the casing assembly using epoxy. Initially, screws were going to be used to attach them, but using epoxy was strong enough and allowed for more room on the inside of the housing.

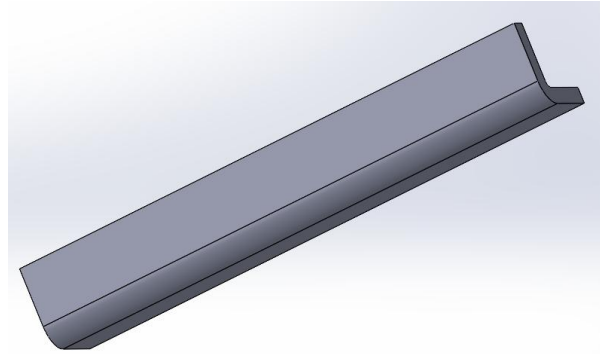


Figure 9: Side corner part.

As for the smaller parts, the key mechanism is a cam lock from McMaster, part number 11125A11, and can be seen in Figure 10. It is attached to the very top of the assembly. The hinge also came from McMaster, part number 1624A61, which can be seen in Figure 11. The hinge was placed at the bottom of the front facing part. It would be spot welded there, and the other half of the hinge would be spot welded to the bottom of the back facing part. This allows the user to open the paper towel holder from the top using the cam lock then rotate it around the hinge for access to the entire inside of the housing.

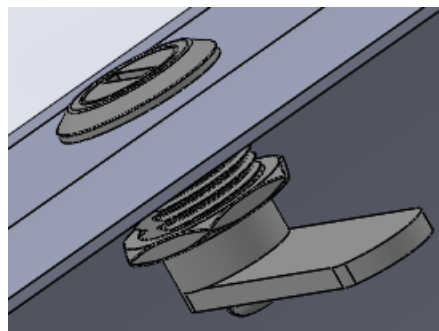


Figure 10: Cam lock.

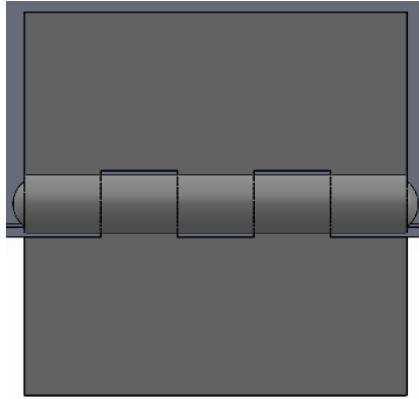


Figure 11: Hinge.