**Project #1 – CAD & 3D Printing**

ME 366 Computer Aided Engineering & Manufacturing

Name

Date

# Overview

I chose a medical tray for project 1, however since it had to have 3 mechanically dependent parts, I chose to use cross supports like in a gurney to be the mechanism that holds and moves the tray. (hold base or one support still, move the other, and the tray and other support will move relative to the base.)

Graphical user interface, application

Description automatically generated

Tray

Support

Base

**Figure 1.** Overall CAD picture of selected assembly with labeled parts

(whatever view best communicates what you picked)

(follow this format when including pictures in sections below)

# How It’s Made

Whiteboard

Description automatically generated

Tray

Support

Base

This medical tray was most likely manufactured by extruding the cylinders for the support and the base, and rolling a sheet and drawing the tray which can be done in a number of methods such as pressing. This design differs mainly due to the lack of assignment constraints requiring relative motion within the assembly, moving cylinders would be considered links and it would not satisfy the assignment definition.

A screenshot of a computer

Description automatically generated with medium confidence

|  |  |  |  |
| --- | --- | --- | --- |
| **Conventional**  **Mnfg Steps** | **Part 1 Name**  **“base”** | **Support** | **Part 3 Name**  **Tray** |
| Raw Stock | Plastic pellets | Plastic pellets | Plastic pellets |
| Create feed stock | Melt down | melt down | Melt down |
| Manufacture | Cast into block w/ two blocks for pins | Roll into sheet or cast | Roll into sheet (or cast due to thick bottom) |
| Drill | drill holes for pins | Attach pins if sheet worked (welding) | Draw basin |
| Milling |  |  | Create gap for supports w/ cylinder to connect supports |
| Finish | Trim excess | Trim excess | Trim excess |
| Finished Product | Base for tray | Support that attaches base to tray | Tray to hold medical supplies |

These particular parts would most likely be cast due to their simple geometries, technically the holes could be included as part of the shape in the mold and finished to meet tolerances. Using this manufacturing process, you could make units quickly and cost effectively. Plastic poses environmental concerns, which produces motivation to seek a “greener” stock. Especially since it is only economical to buy casting molds for these parts if used in mass quantities.

# Part Models

## Base

Graphical user interface

Description automatically generated

* I used loft to create the base for my part, while playing around with the features I found that by switching the order of the sketches you are lofting can change from ( in this situation ) a block to this spiral shape. I would imagine this is not desirable for actually printing, due to the need for support material on overhangs, added complexity of geometry, etc.
* Extrude base for pin blocks.
* Extrude cut holes
* Shell to create gaps in the blocks.

## Support

Graphical user interface, application

Description automatically generated

* Casting is a cheap way to manufacture this if it is produced in mass quantities, although, an alternative is sheet metal working, however, you would need to add the cylinders by welding or another alternative method to attach.

## Track (did not end up using in final assembly, unnecessary part if tray and support are designed to attach straight to each other using cylinders and slots)

Graphical user interface, surface chart

Description automatically generated

* This would be easiest to cast as well, given large quantities but it can also be cold worked if needed to meet strength tolerances or to avoid paying for a mold.

## Tray

Graphical user interface, application

Description automatically generated

* This part could be made in a multitude of ways, depending on material, number of units and desired tolerances, if made of metal in high quantities it can be sheet metal worked or cast.
* Problem with sheet metal working is depth of the tray would make it stronger and therefore require stronger tools.

## CAD Operations

|  |  |  |  |
| --- | --- | --- | --- |
| **CAD Operation** | **Part name** | **Profile Sketch** | **Profile or Path Sketch** |
| Extrude | Support | Sketch 1 | A screenshot of a computer  Description automatically generated |
| Revolve | Support | Sketch 13 | A screenshot of a computer  Description automatically generated |
| Sweep | Support | Sketch 14 | A screenshot of a computer  Description automatically generated |
| Loft | Base | Sketch 1 | Graphical user interface  Description automatically generated |

# Assembly Model

Support A and B are constrained to the holes in the base and support A can rotate from 0-90 deg, and Support B can rotate from 90-190 degrees, giving 2 positions for the tray. Supports A and B are also constrained to the slot in the tray, only able to slide tangent to the slot with boundaries 1 in from both sides, tray must remain parallel with the top plane (base plane)

Graphical user interface, application

Description automatically generated

Graphical user interface, surface chart

Description automatically generated

# Graphical user interface Description automatically generated

# 3D Printing

The design is simple, a block with an outward facing slope of about 2.5 in tall, 4 in wide, and 3 in deep. I will be using it as a foot stop to nook my foot and keep it rooted whilst I skateboard. “MILK” is cut extruded into the top.

Graphical user interface

Description automatically generated

* The resolution primarily impacts the curvature of the edge, since 3D printing converts my file first into triangular geometry, with worth resolution, the sharper the steps will be on the curve. Orientation is important specifically for the words that will be cut into the part due to layering which can affect resolution.
* Insight is to me, like the printer window for word but in a separate application in which you can select part orientation, calculate build time, support material volume, part volume, etc.
* Name and group letter debossed on bottom

# Conclusion

I would say the most beneficial thing I got from this project was just playing around with solidworks trying to figure out how to get what is in my head down on the screen. Specifically, constraints for certain solidworks operations. For example, having the correct bases and guidelines to loft between two different shapes, or ensuring correct dimensions for mating. Although the majority of what I learned is simple navigation through solidworks, like rotating, zoom, ensuring your in the correct sketch, all simple but important for time sake. There are often shortcuts you can make to simplify your design if you can figure out a more efficient way to design it. For example, removing the “track” part from design by simply making a slot that allows the same degree of freedom and removes an unnecessary part.