Final Project: Webcam

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1930525

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Technical Drawing (420-LCV-05)

Section 01

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Abstract

Design of Webcam Connected with USB A wire

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Technical drawing is a discipline and part of any engineering process that requires design. Using many manual techniques, we can sketch and design various objects and parts that range in size and complexity. CAD programs such as Fusion 360 are programs that computerize the process and facilitate the sketching, design and testing of objects. This report describes the design of a webcam using Fusion 360 following ASME standards and primary metric units. Currently, webcams remain crucial for online conferencing, online courses, and streaming. The USB A connected webcam designed in this report is a camera with a sound-cancelling microphone and two-piece stand that allows it to be placed on top of any monitor, laptop, or tabletop.

Keywords: ASME, CAD, USB, webcam, design, sketch

Design Process

Minor changes

This final project attempts to accurately recreate my personal webcam that I use for online school. However, some parts and details have been omitted due to complications. Such parts are the actual camera (the lens), the circuit and wires. Another part was redesigned because it was initially designed too complicatedly for no reason. The inside of the front cover's shaft that houses the screw from the other side, in the real camera, is a very small shaft the screw passes through. I omitted this detail because I felt there was no reason for it to be like that when a big head long screw perfectly does the job.

Division of files

I had originally planned to do all the parts in the same file and use the as-built join command; however, I was met with some difficulties in accurately constructing parts on each other. Some parts of the camera are glued together such as the hinge and the two stands next to it. It was easier to create them separately in different files then importing and joining them in the 'Assembly' file. Some parts, that were easier, were completed in the 'Assembly' file. The other files are 'Front cover', 'Middle hinge', and 'Stand p2'. Disregard 'Screw Hole', I initially used it for the hole in the back of the housing, but as explained above I redesigned this part such that it is only a hole and not a shaft.

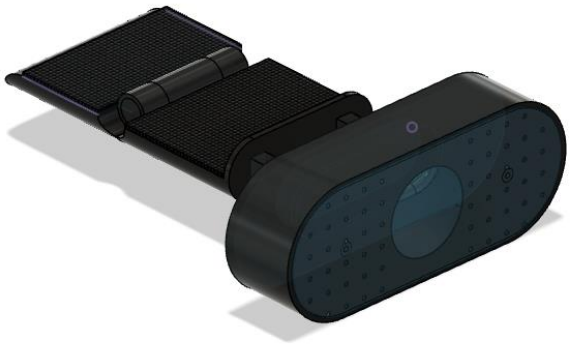


Figure 1: Assembled

Front Cover

1) Sketch front part with 2 arcs (15mm radius) connecting with 2 lines (43.327mm) and a circle in the middle (20mm diameter)
2) Extrude 0.125mm
3) Offset the edge by 0.125mm

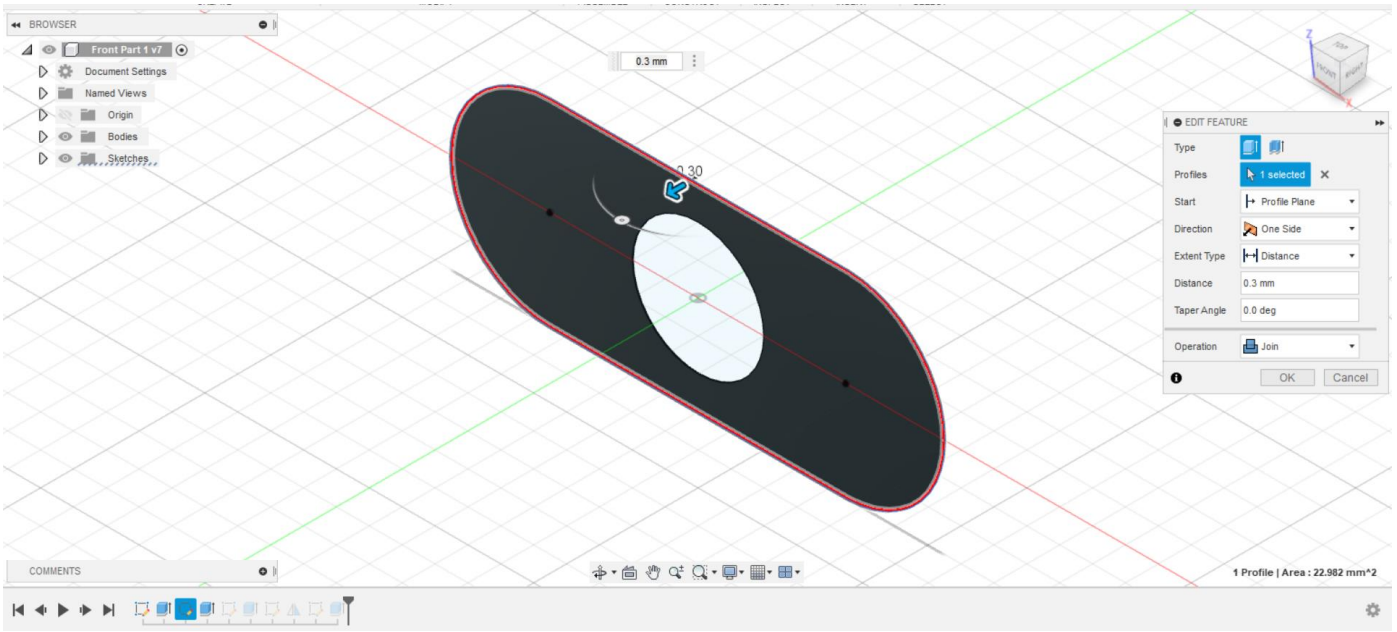


Figure 2: extruded front cover

4) Extrude offset edge by 0.3mm
5) Sketch a 3mm diameter circle with a 1.2mm diameter hole that will be used as a hole for our screw and extrude the shaft 11m. Using the mirror feature mirror do this on both sides.

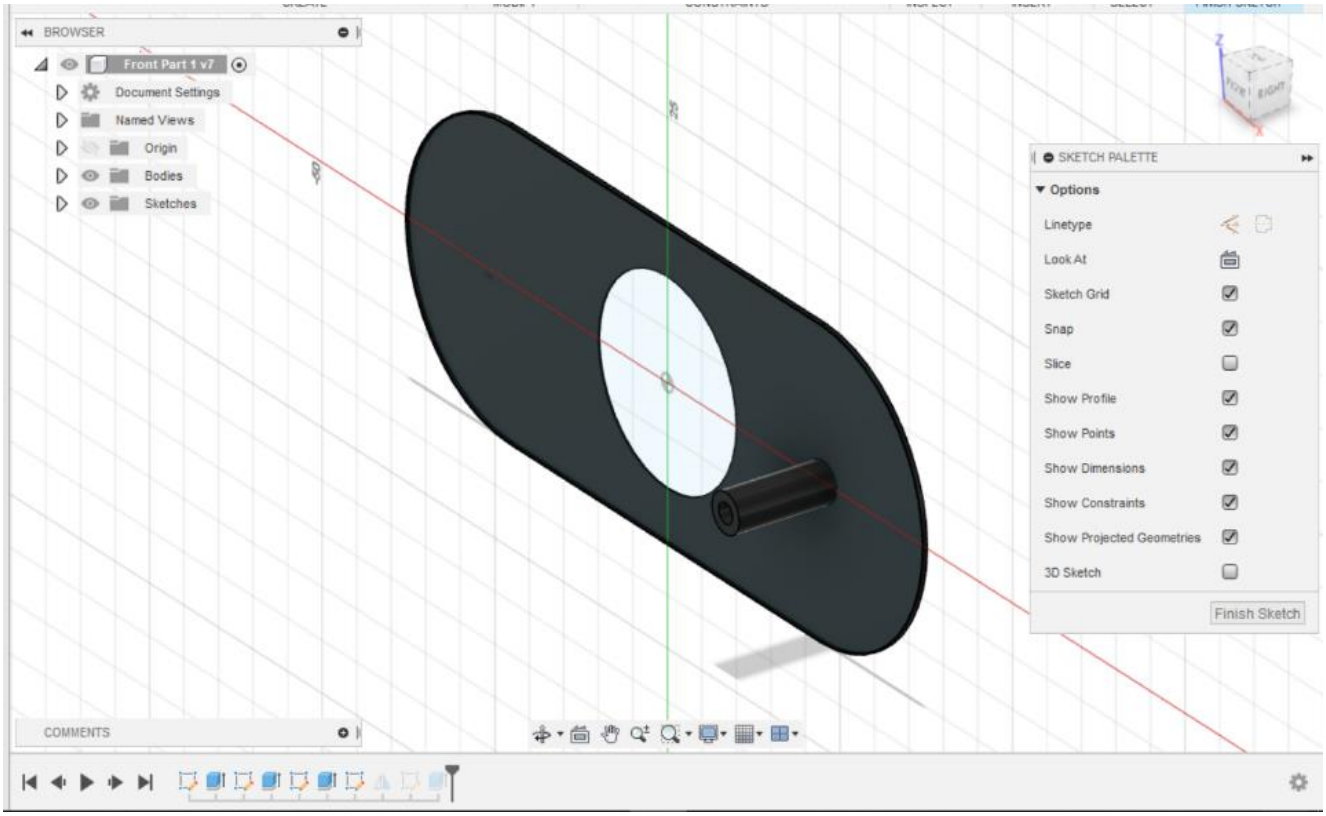


Figure 3: Front cover shaft

6) Using the rectangular pattern feature sketch holes 1mm diameter for the microphone on one side then mirror
7) Extrude all of the holes to the back so that they go all the way through

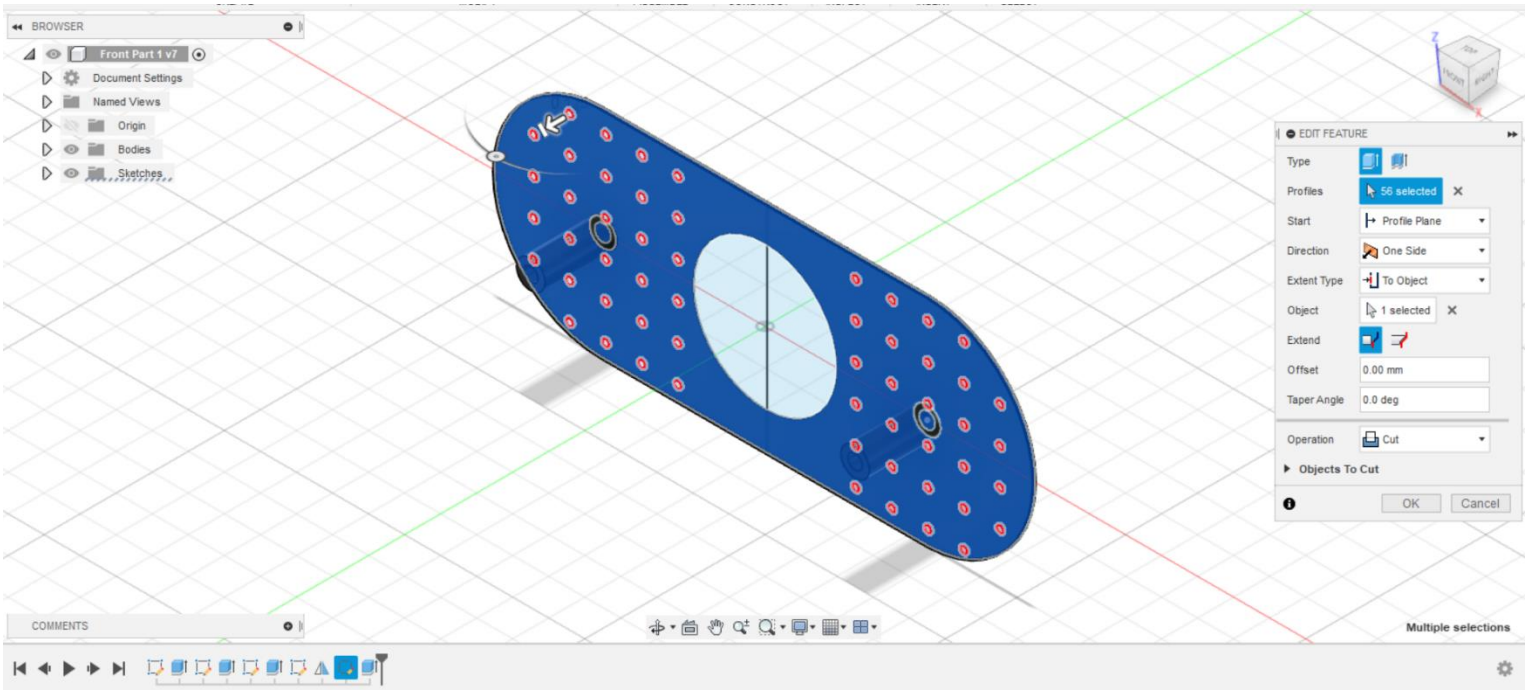


Figure 4: microphone holes

Housing & First Hinge

Create the 'housing' component

1) Create the sketch of the back side using arcs (15mm) and 2 connecting lines 47.75mm
2) Create a plane 18mm away from the back side

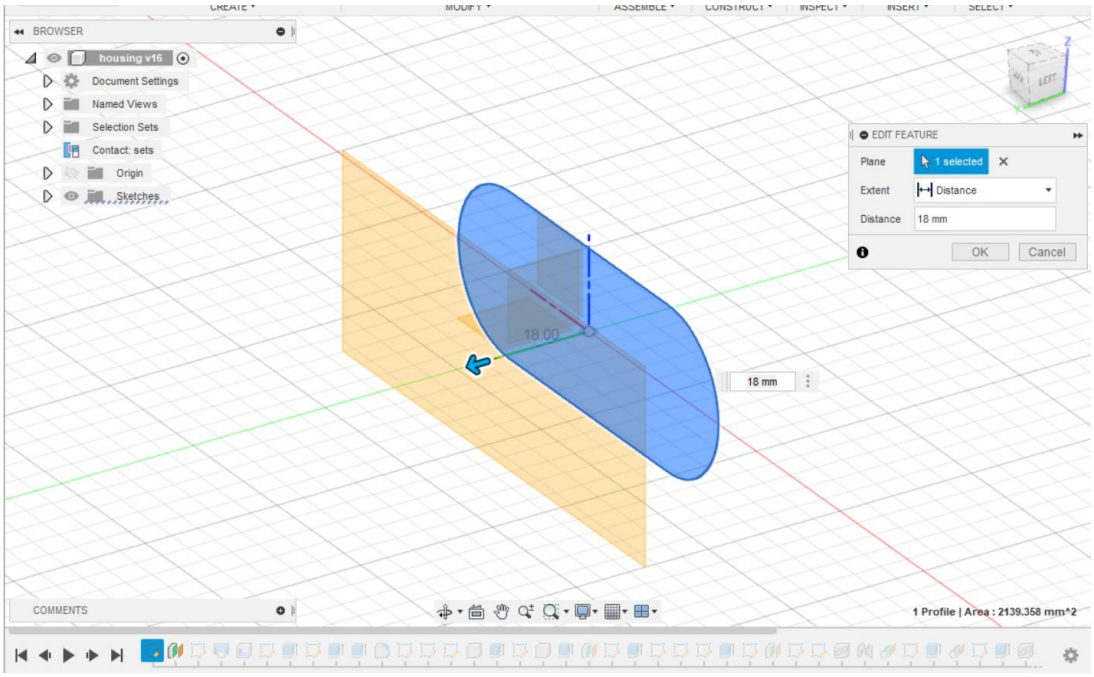


Figure 5: housing plane

3) Loft the 2 sketches

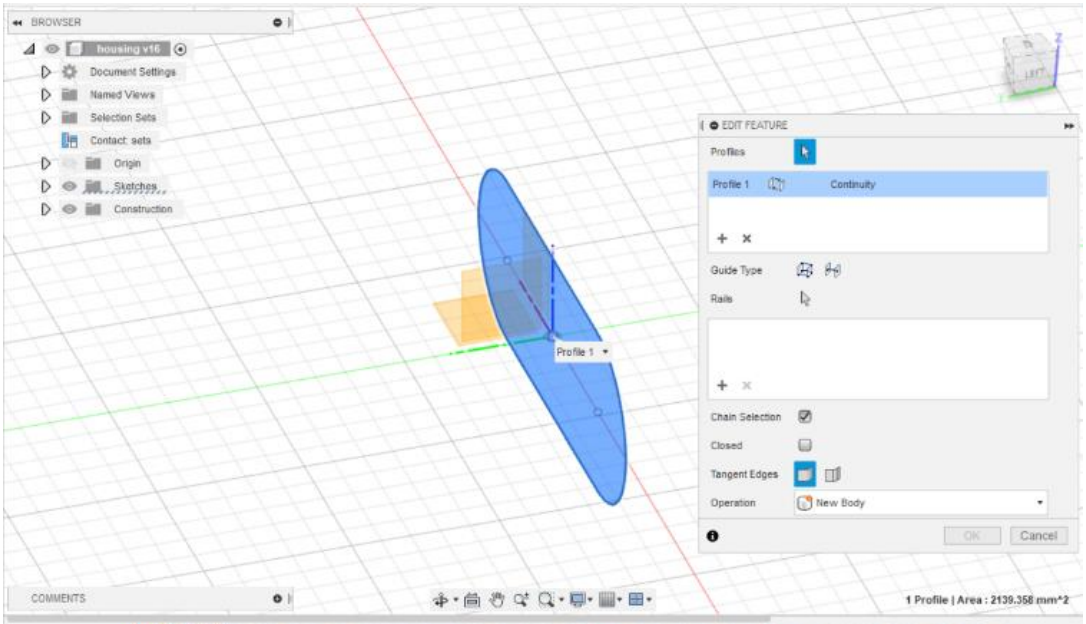


Figure 6: loft 2 shapes

4) Shell the object (thickness 1.25mm)

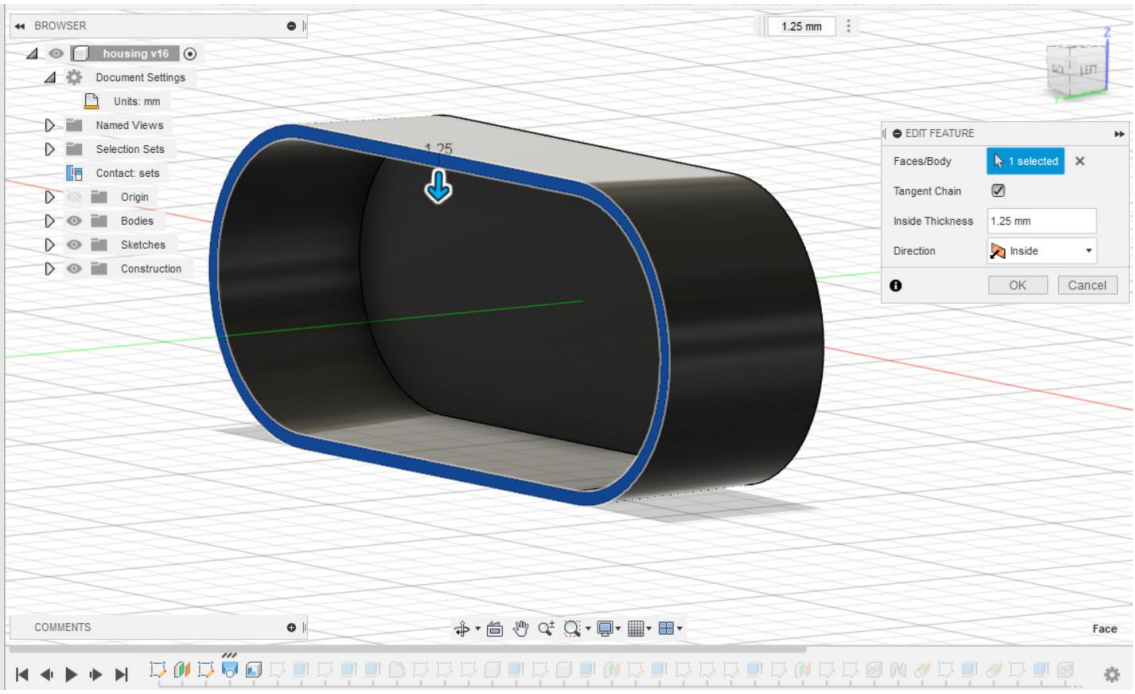
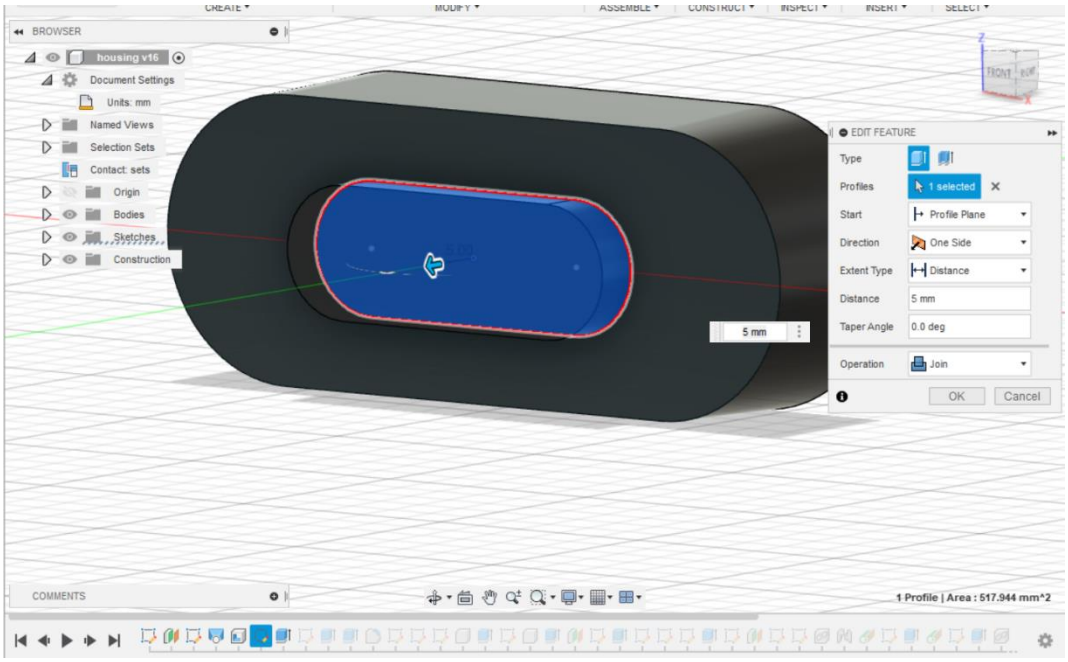


Figure 7: shell housing

5) On the back of the object sketch a similar looking sketch with 2 arcs (7mm radius) and 26mm connecting lines
6) Extrude 5mm.



7) By hiding the front cover on the inside of the housing sketch two 1.2mm holes 22.5mm away from the centre. The screws will pass through here connecting to the shaft in the front cover
8) Rigid join the screws (McMaster Carr components)

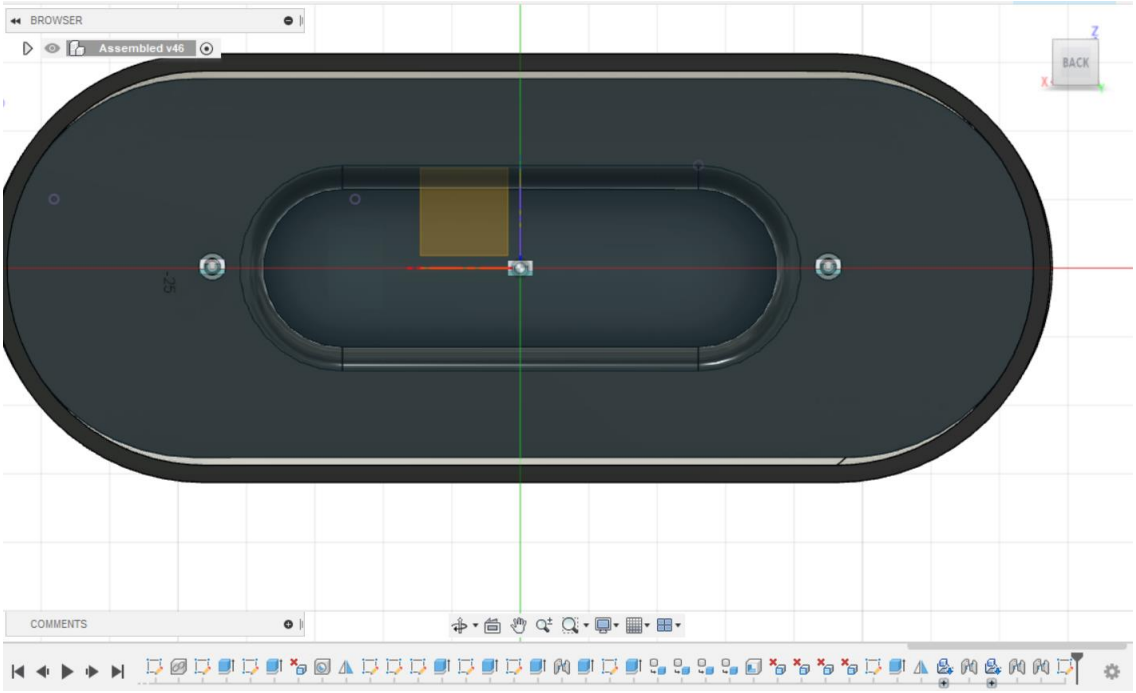


Figure 8: screws

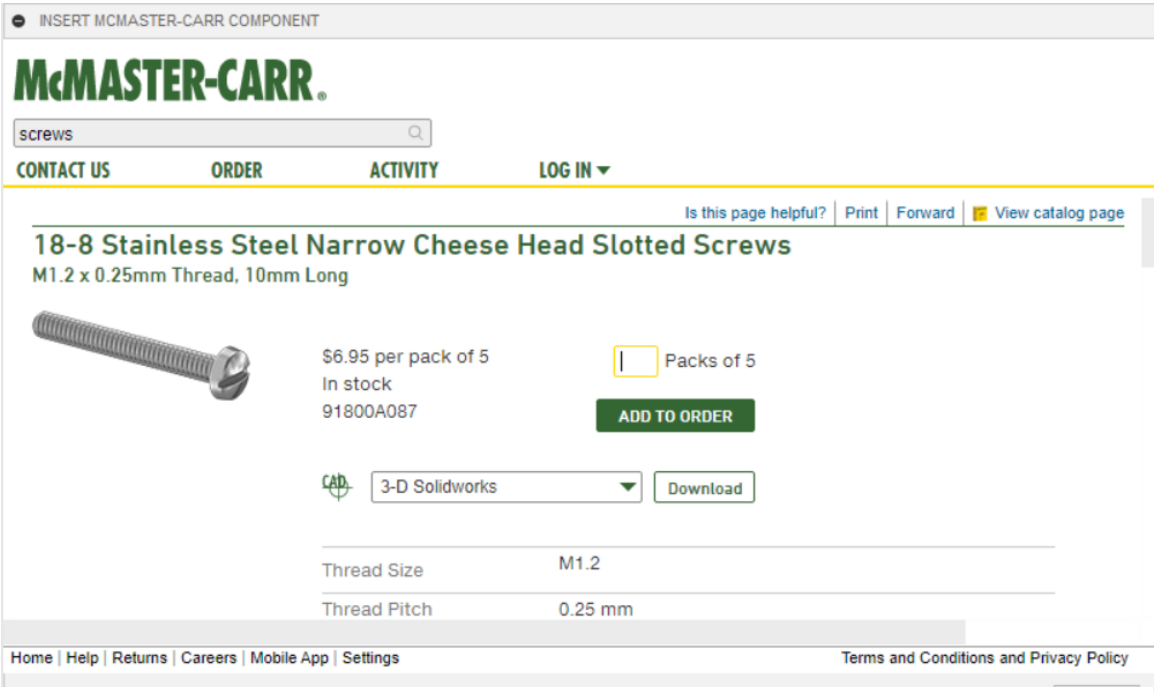


Figure 9: McMaster-Carr

Create ‘hinge holder’

9) Sticking out of the centre of the extruded object sketch the hinge holder. 5mm circle. 8mm line, 4mm line perpendicular and a 4mm radius arc

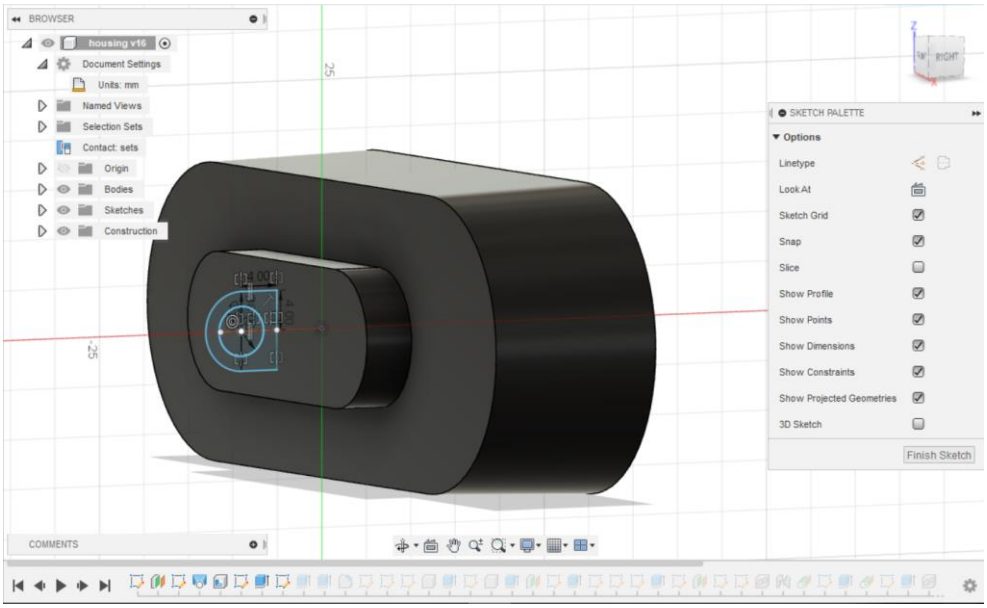


Figure 10: hinge holder sketch

10) Extrude the circle 14mm in each side
11) Extrude the rest of the shape 10mm in each side.
12) Fillet The back

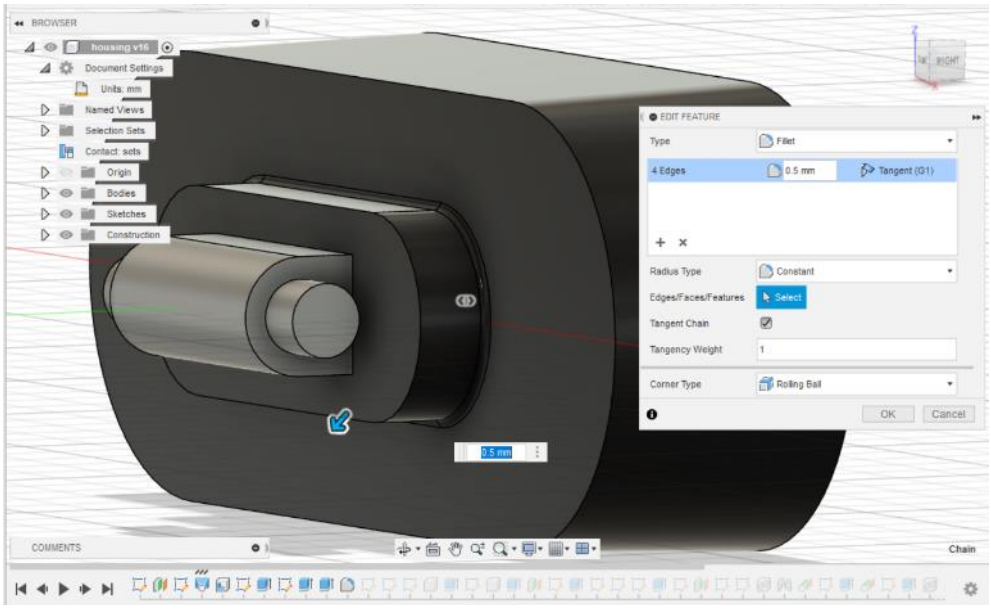


Figure 11: fillet back

Create 'hinge rotator' R & 'hinge rotator L':

13) On the hinge sketch a 6mm diameter circle tangent to 10mm lines on the top and bottom of the circle. Connect the lines (component 3)

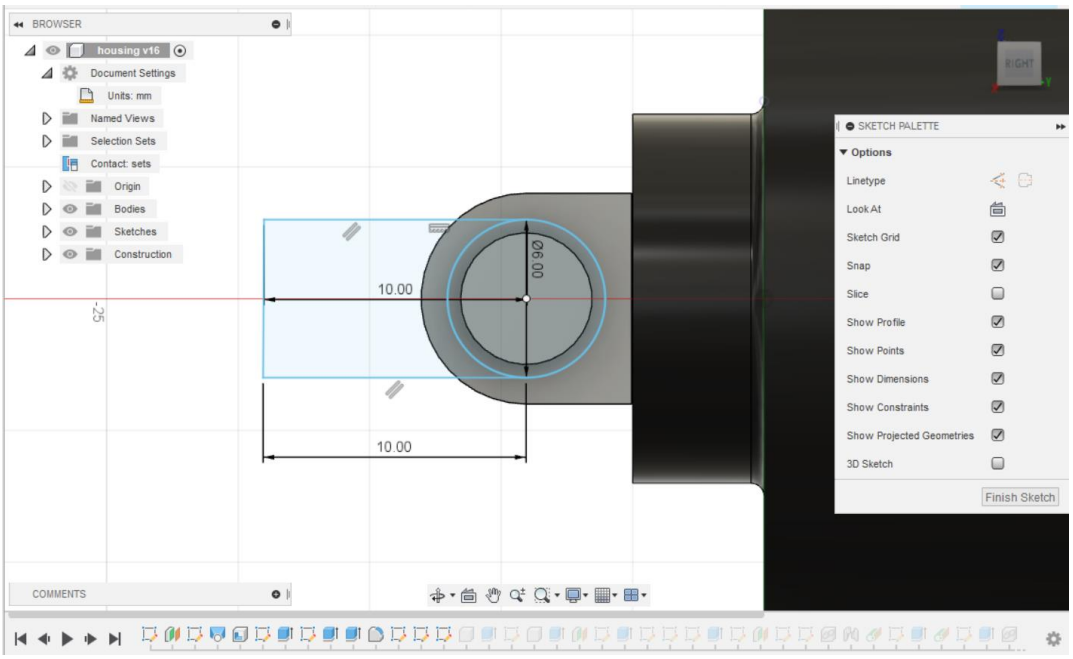


Figure 12: sketch hinge rotators

14) Same on other side (component 2) and extrude fully to hinge holder
15) Create plane tangent to the moveable holders (components 2 and 3)

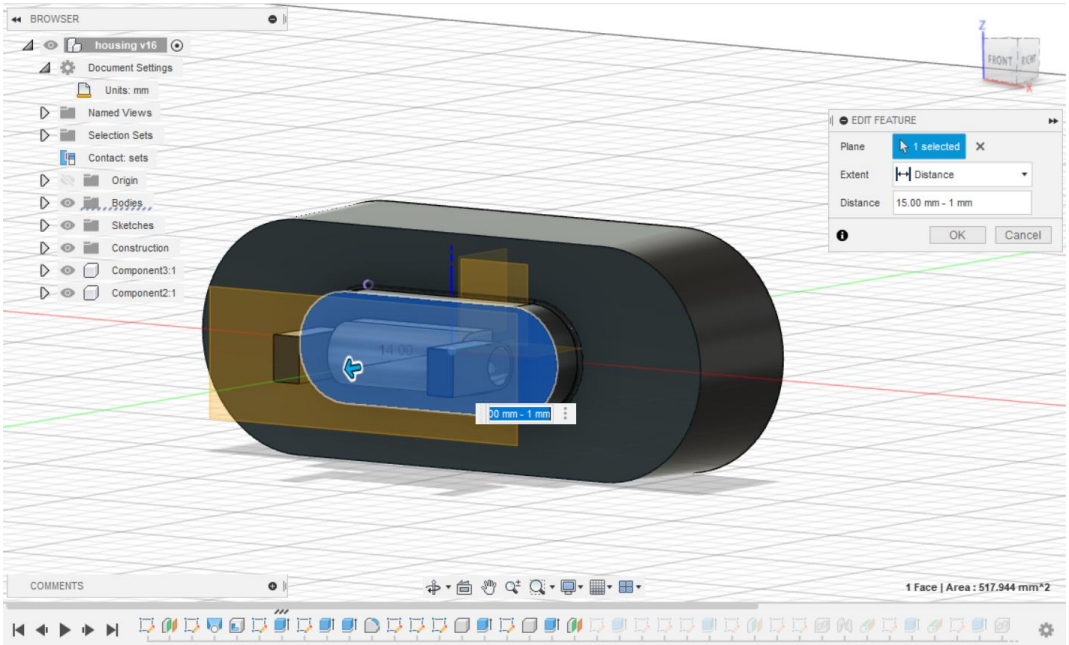


Figure 13: stand p1 back plane

Create ‘Stand p1’:

16) Using the project feature project the back

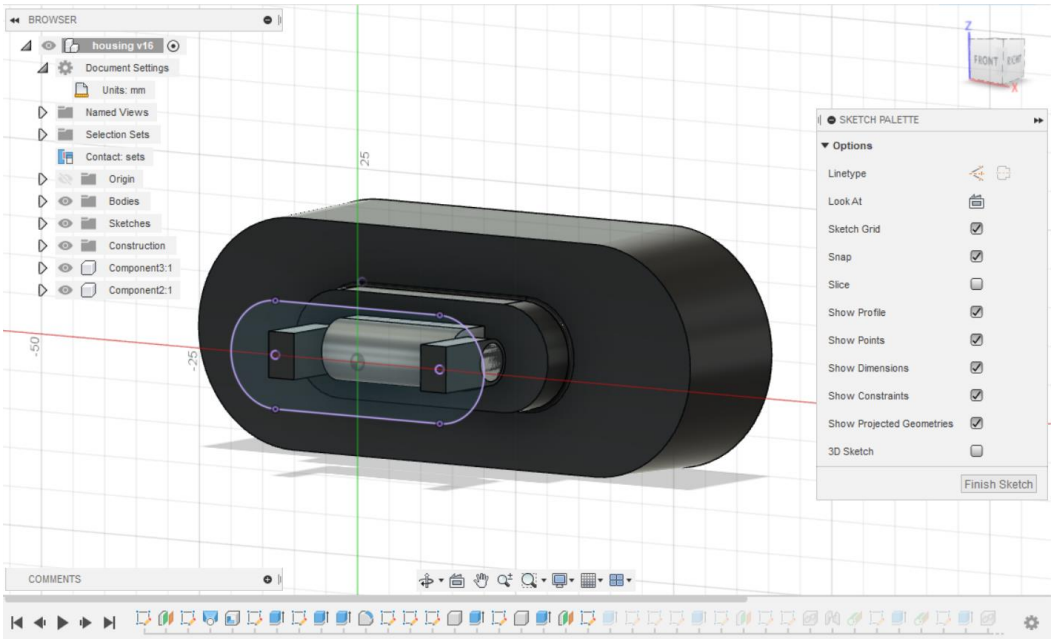


Figure 14:project back

17) Extrude 1.5mm
18) Sketch lower half and extrude 33mm

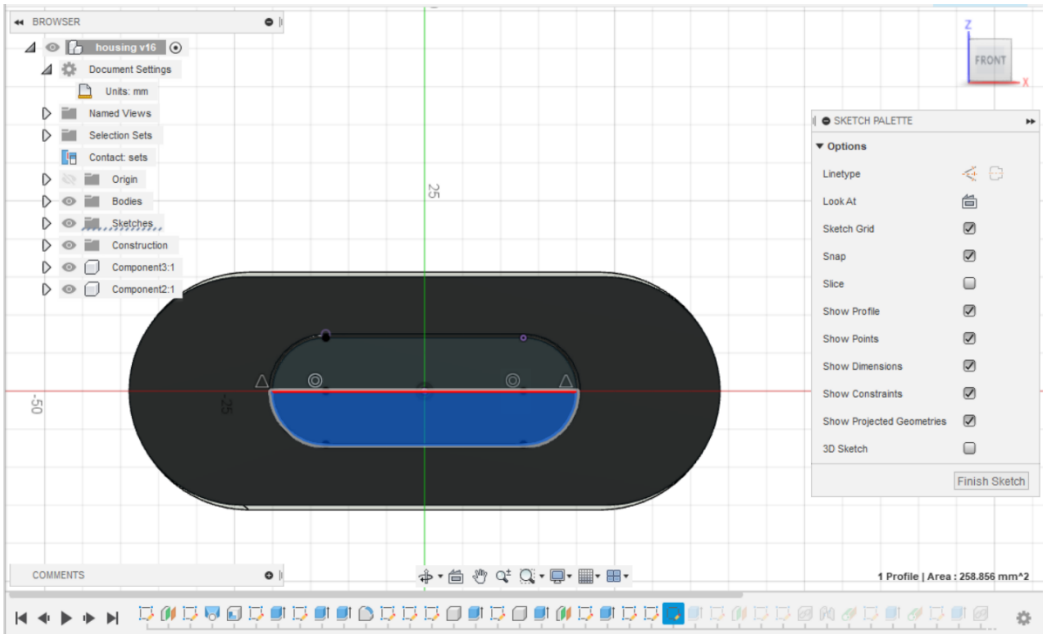


Figure 15: extrude stand p1

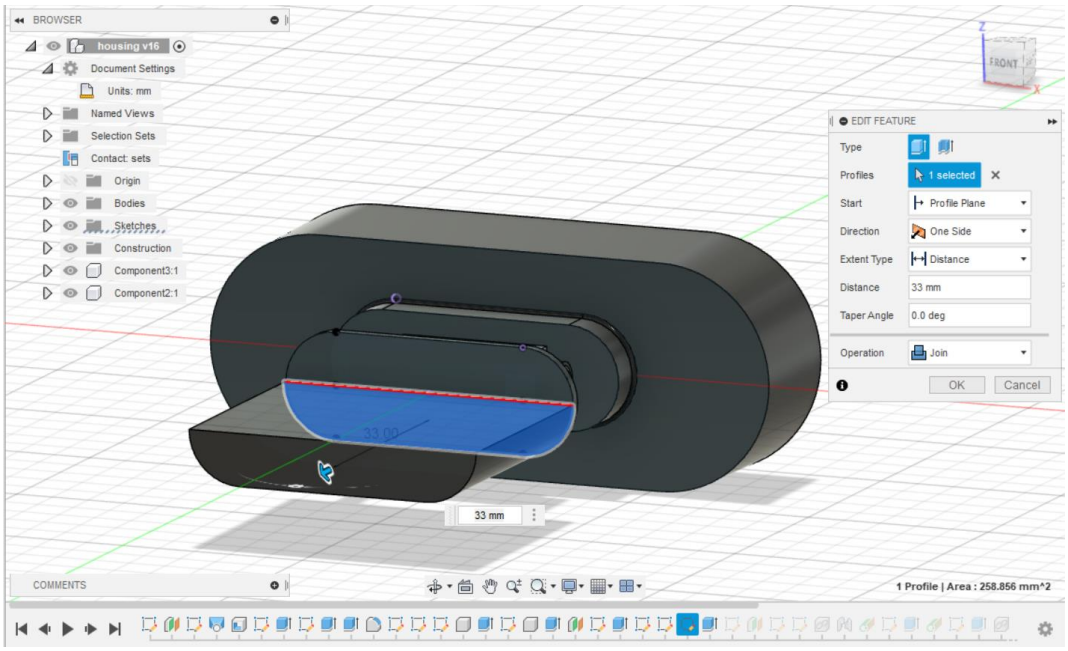


Figure 16: stand p1

- Go to hinge file to create hinge that allows 2 closable parts to close

Middle Hinge

1) Create a 8mm circle with a 6mm circle centered in it.
2) Extrude outer circle 15mm (call middle cylinder)

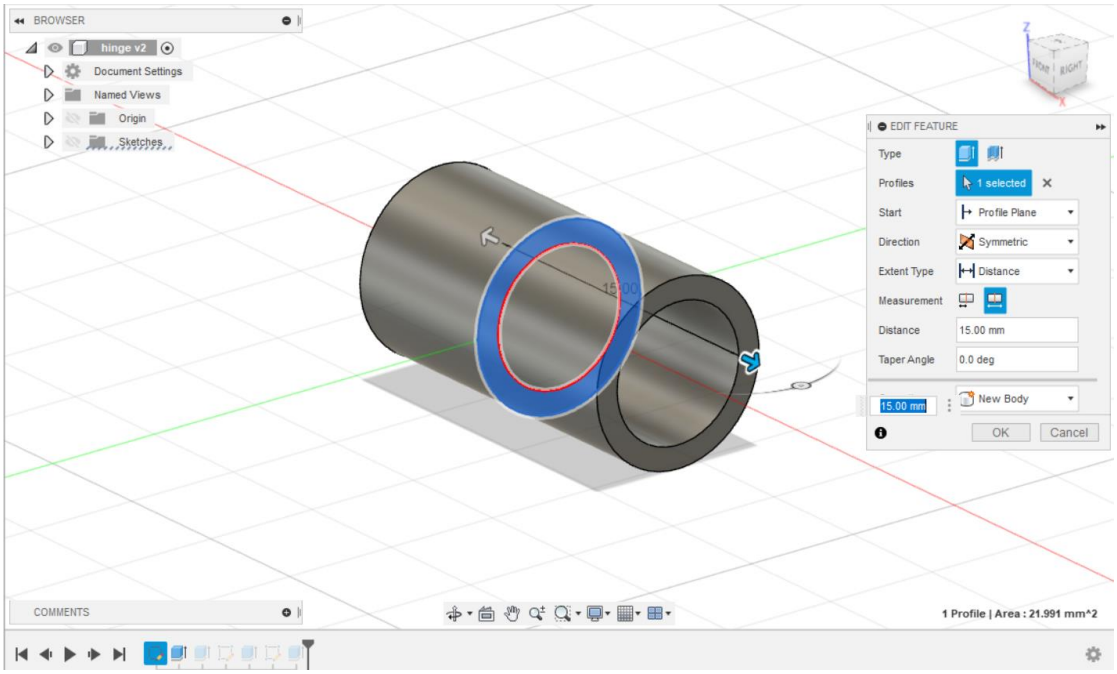


Figure 17: extrude hinge outer circle

3) Going back, extrude inner circle 29mm
4) On the side on the 29mm cylinder draw a 8mm circle that will be extruded as a new body to the middle cylinder

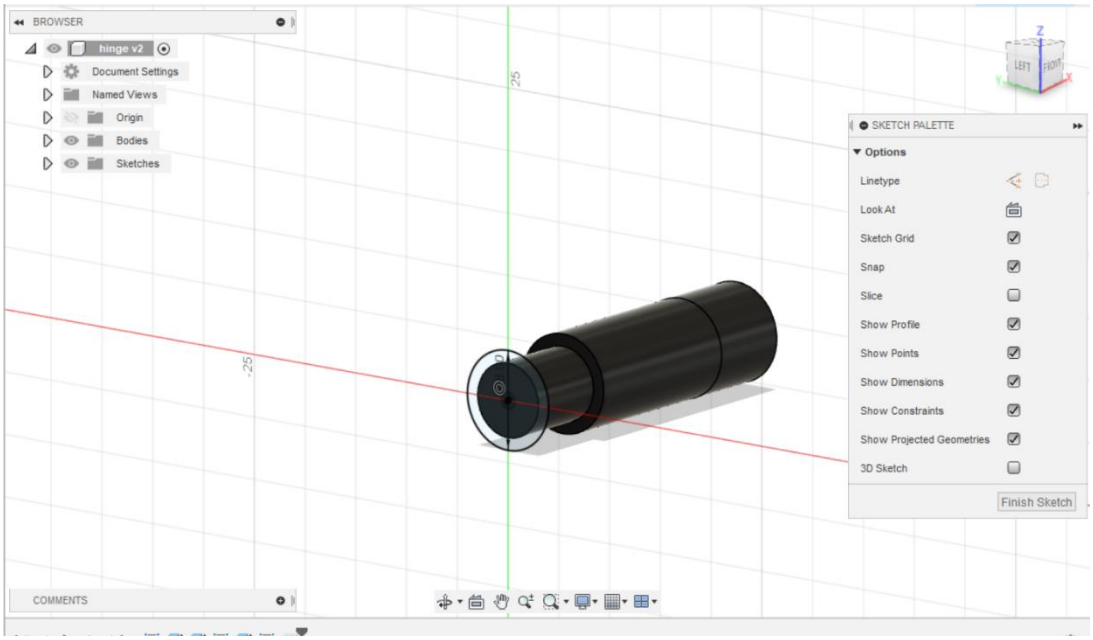


Figure 18: extrude inner circle

5) Import the hinge and join as rigid component to the end of camera stand in ‘Assembly’

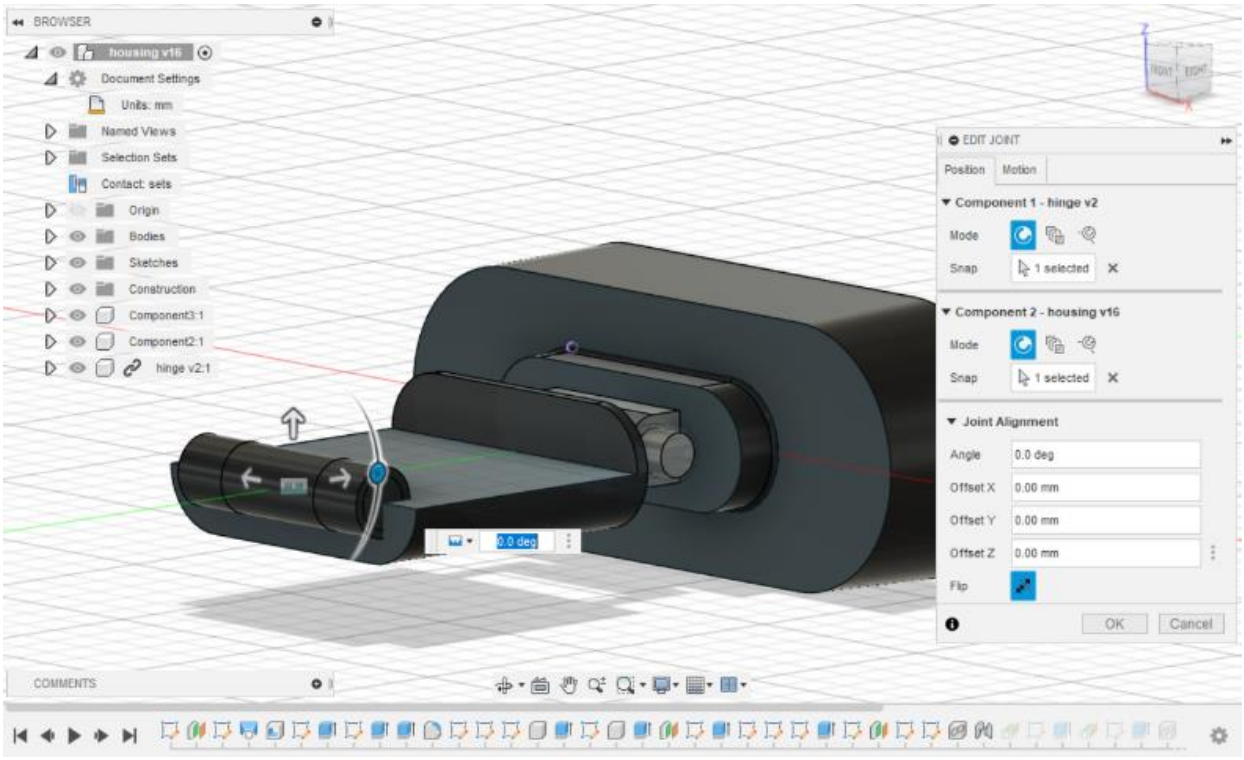


Figure 19: join hinge

6) Create plane tangent to the stand

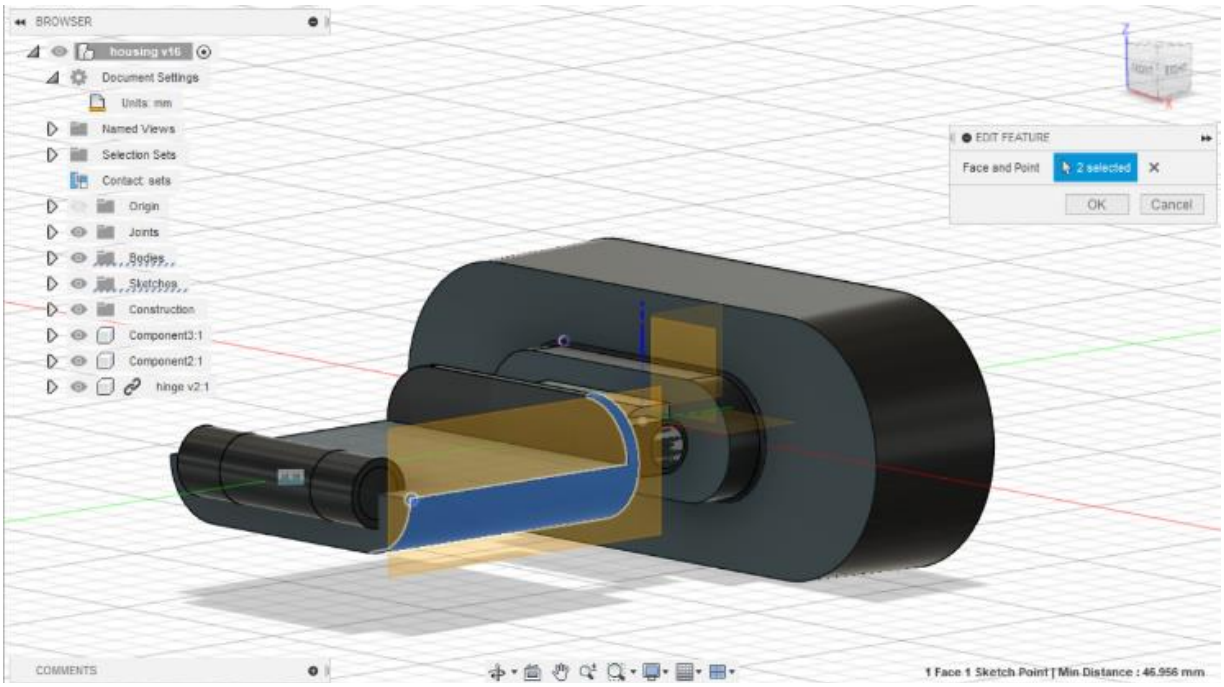


Figure 20: plane tangent to stand p1

7) Sketch two 4mm lines joined with a 4mm arc such that it cuts to the hinge **(This will be edited in a later step to make it cut under that the hinge)**

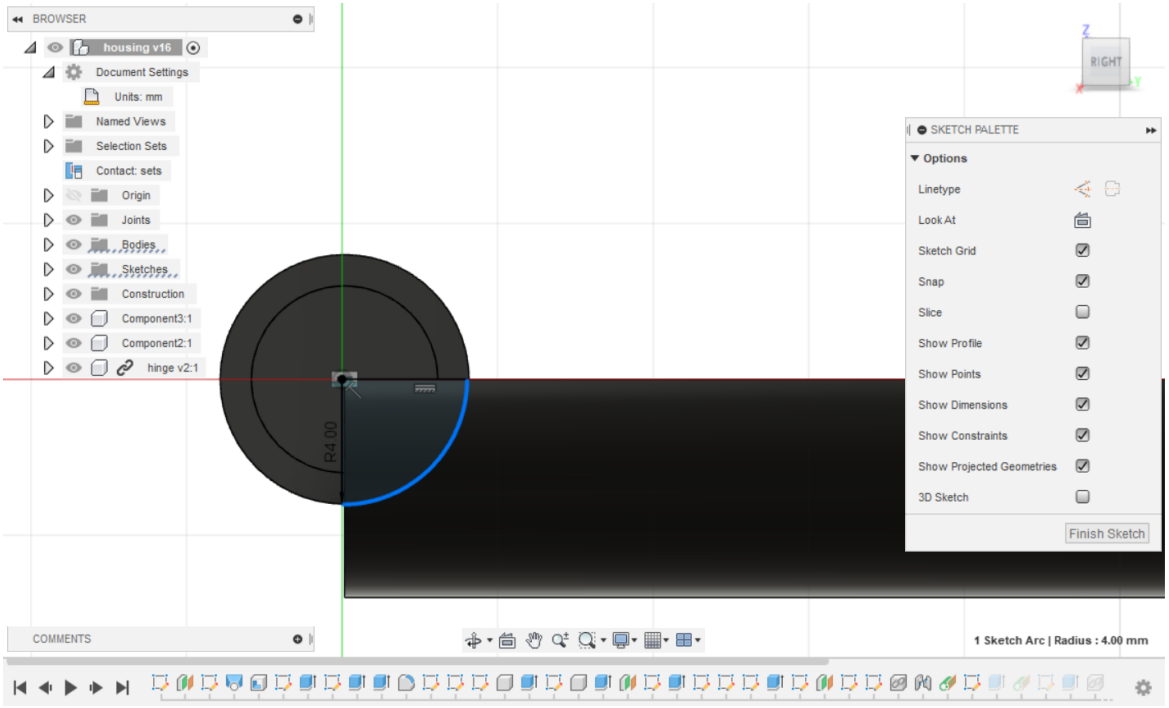


Figure 21: sketch hinge/stand cut

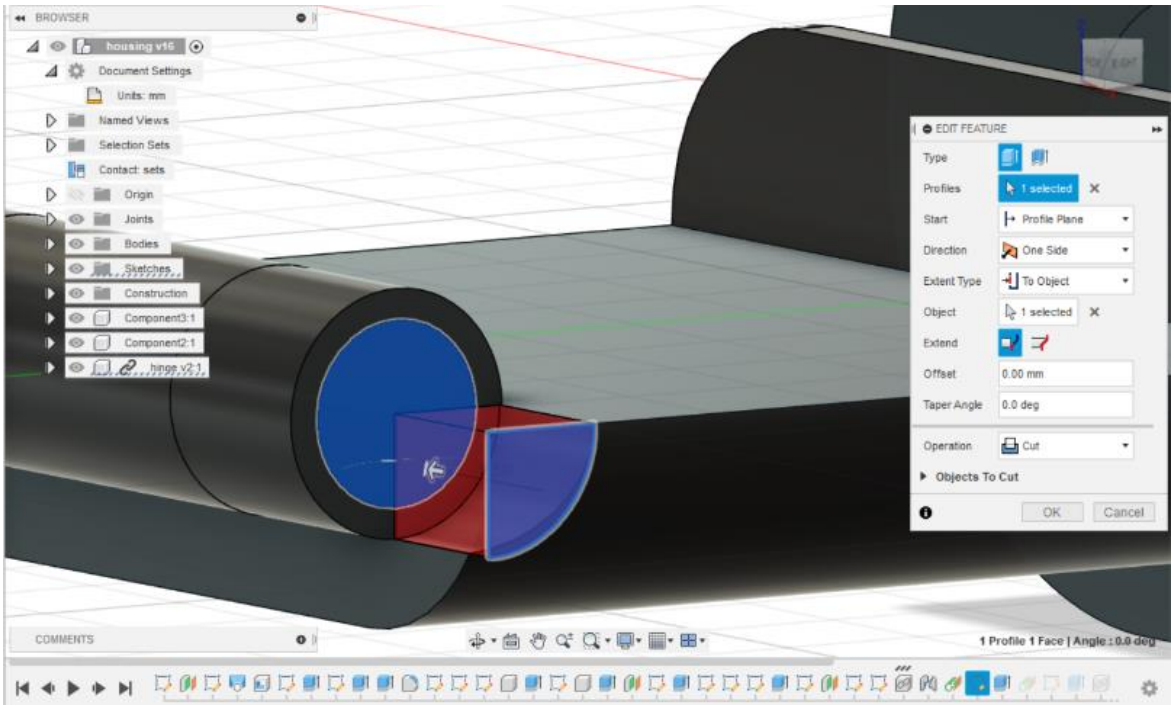


Figure 22: cut to hinge

Stand p2

1) Using the same way as ‘Stand p1’ was created, create the second part of the stand
2) In the corner of the component sketch a 4mm line joined with another 4mm line and 4mm arc. This is where the middle hinge will sit.
3) Fillet the sides on the bottom 7mm

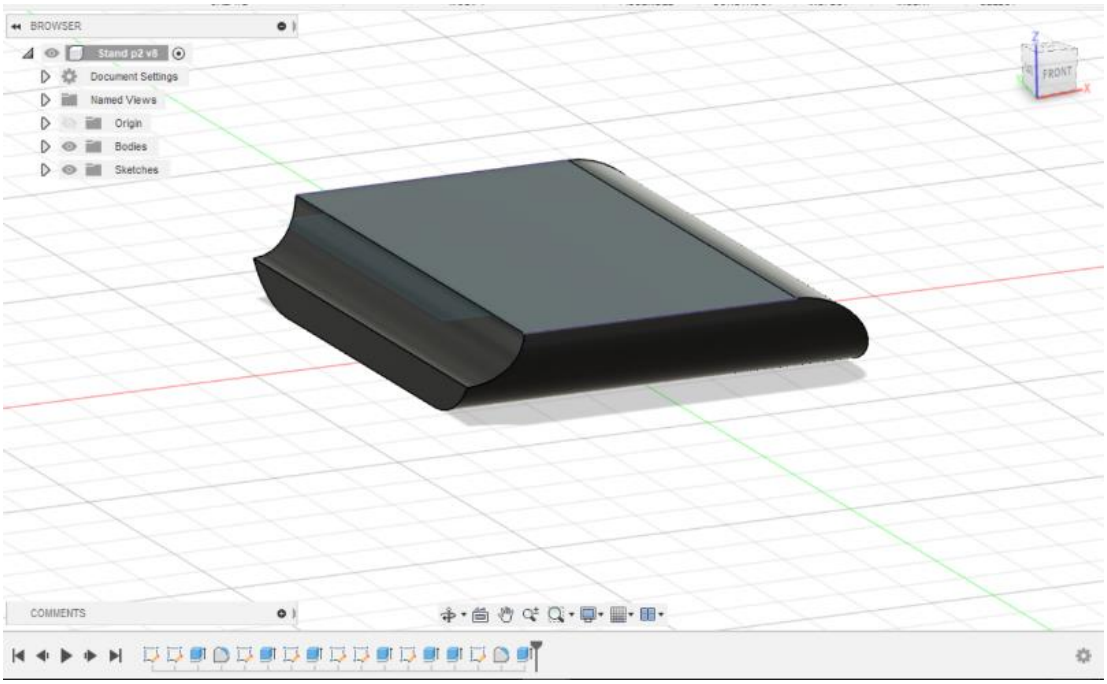


Figure 23: stand p2

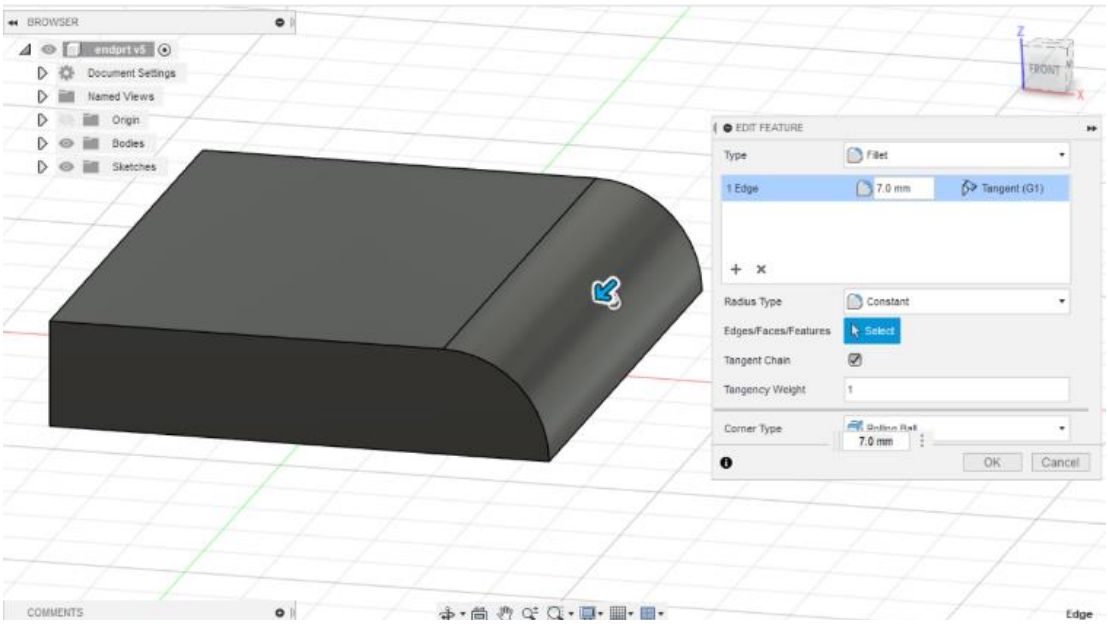


Figure 24: stand p2 fillet

In ‘Assembly’:

4) Import and join ‘Stand p2’
5) On top of the 2 stands create 1mm pads

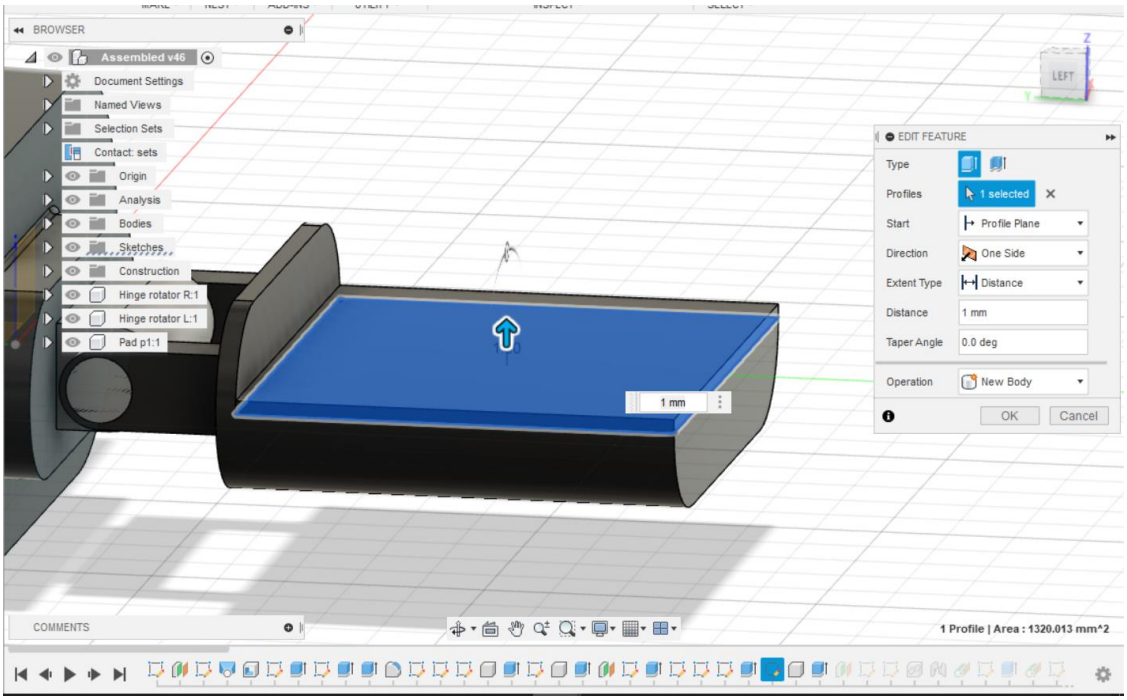


Figure 25: extrude pads

6) Edit ‘Stand p1’ by cutting a part where the middle hinge is placed. Two 4mm lines joined with a 4mm arc

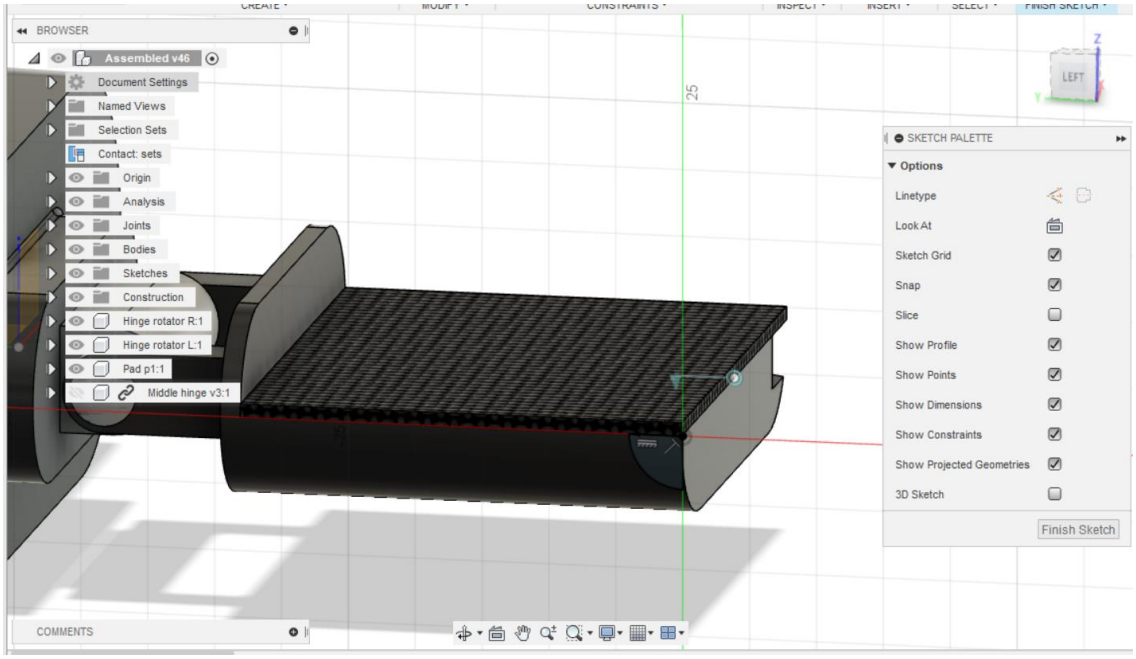


Figure 26: fix stand p1 cut

Appearance:

1) Apply a plastic appearance to the entire camera and fabric to the pads (the two screws are steel)

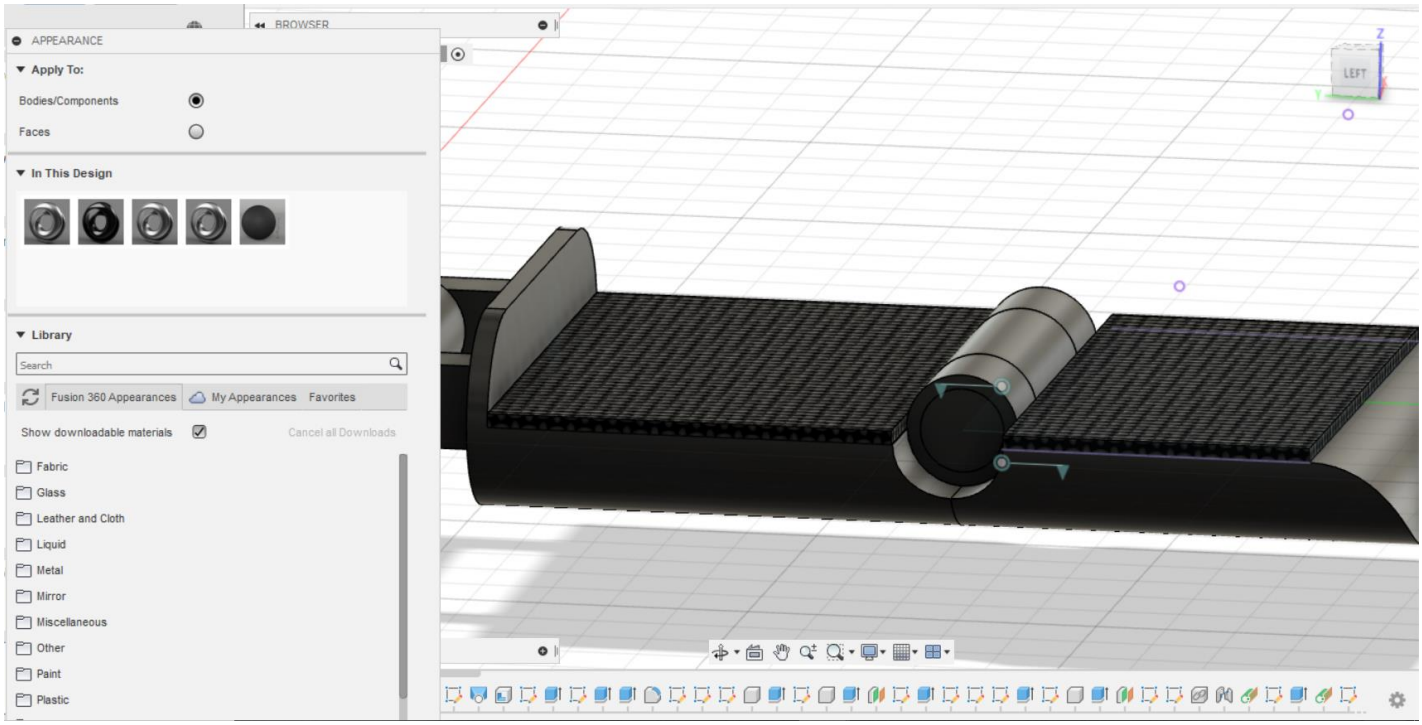


Figure 27: Appearance