INDUSTRIAL AUTOMATA AND DEVICES

(Project Report)

Harshit Verma (302601)

FACULTY OF MECHATRONICS - Warsaw University of Technology

1. INTRODUCTION

Vibratory feeding bowls are necessary in the industry for distributing and arranging specific products for further processing like packaging. Vibratory feeders are a circular bowl like vibrating mechanism, the circular bowl has an ascending platform going in a spiral to the top of the bowl. The vibrating mechanism allows the objects that putted inside the vibratory feeder, to move up the platform using the spiral pathway. The upward motion is provided by the vibrations caused in the vibrating mechanism. Inside the pathway, there are certain features known as traps. The traps help the product get sorted and achieve the most optimal orientation, which the designer wants.

2. DESCRIPTION OF PROJECT TASK

We are supposed to select an item and design traps for a vibratory feeder, which allow us to achieve optimal design and required orientation of the item.

3. PRESENTATION OF SELECTED ITEM

The item I have selected is, The Push Cap for Tubes, which is used to seal and protect the open ends of tubes in various industries. It prevents contamination, ensures the containment of tube contents, aids in transportation, and is commonly used in laboratory, medical, and manufacturing applications.

4. POSSIBLE ORIENTATIONS OF THE ITEM

4 possible orientations for the object that I have selected are:

1. Base-on-bottom
2. Top-on-bottom
3. Base-faced-Forward
4. Top-faced-Forward

The above orientations are shown in the picture below, relative to the numbers given to the orientations.

Figure 4-4-1 Possible four orientations for the Push Cap

5. CHOICE OF AN ORIENTATION:

I have chosen orientation no. 1, which is 'Base-on-bottom', based on factors such as efficiency, assembly requirements, and compatibility with downstream processes.

Figure 5-1 Chosen orientation is No.1, 'Base-on-bottom.'

6. DESCRIPTION OF THE TRAP DESIGN:

Figure 6-1 Part 2 of the Trap Designs.

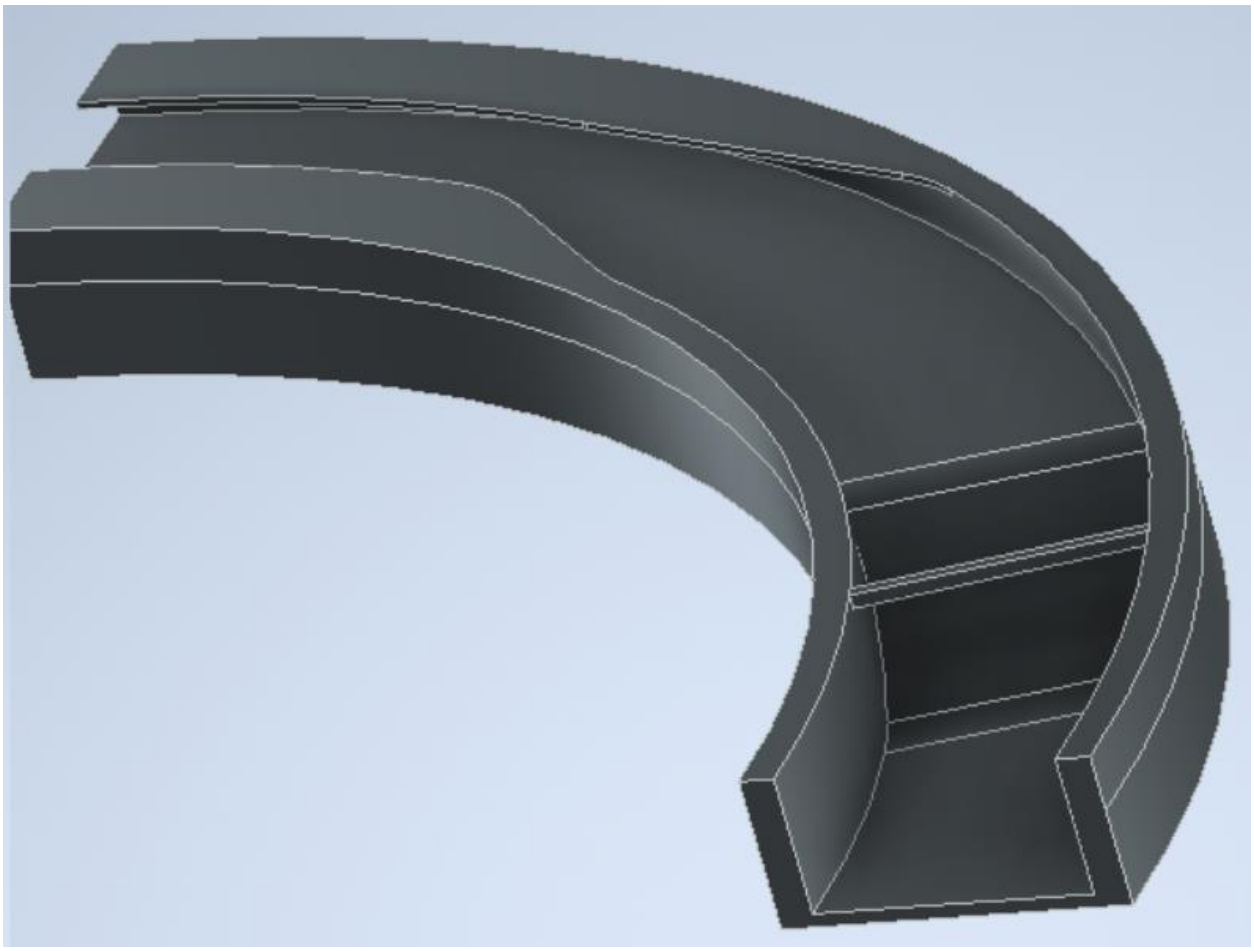

Figure 6-2 Part 1 of the Trap Designs

I've designed three traps for the push cap tubes:

- The first trap flips push caps to either a top-on-base or bottom-on-base position by holding out the Base-faced-Forward or Top-faced-Forward orientations. Which eliminates 2 orientations for the item.

- The second trap collects all push caps oriented with the bottom-on-base. The extended flaps of the trap catch all the bottom-on-base oriented push caps.
- The third trap flips push caps from a top-on-bottom to a bottom-on-base position by flipping them. The push cap falls from a height while moving linearly, this helps the part to flip and land on the other face of the push cap.

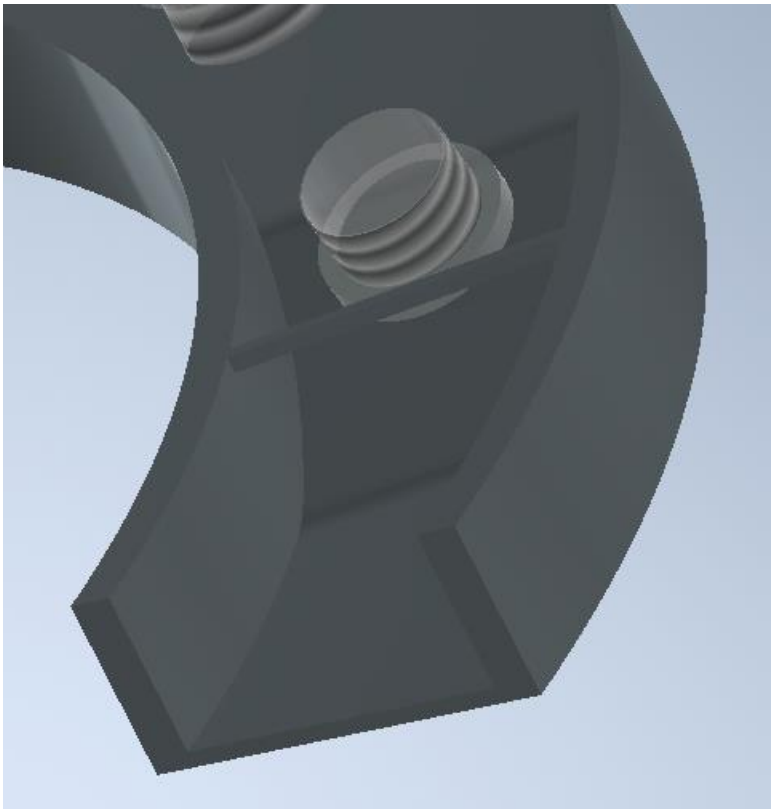

Figure 6-3 The first trap flips push caps to either a top-on-base or bottom-on-base position.

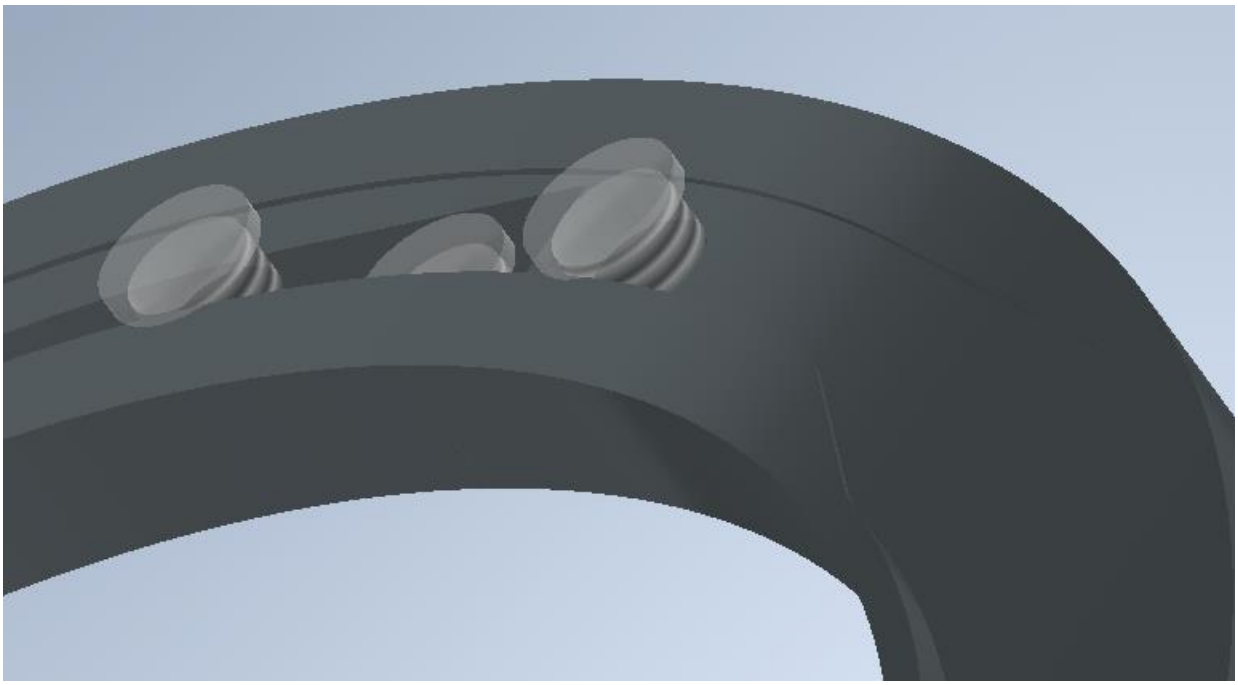

Figure 6-4 The second trap collects all push caps oriented with the bottom-on-base.

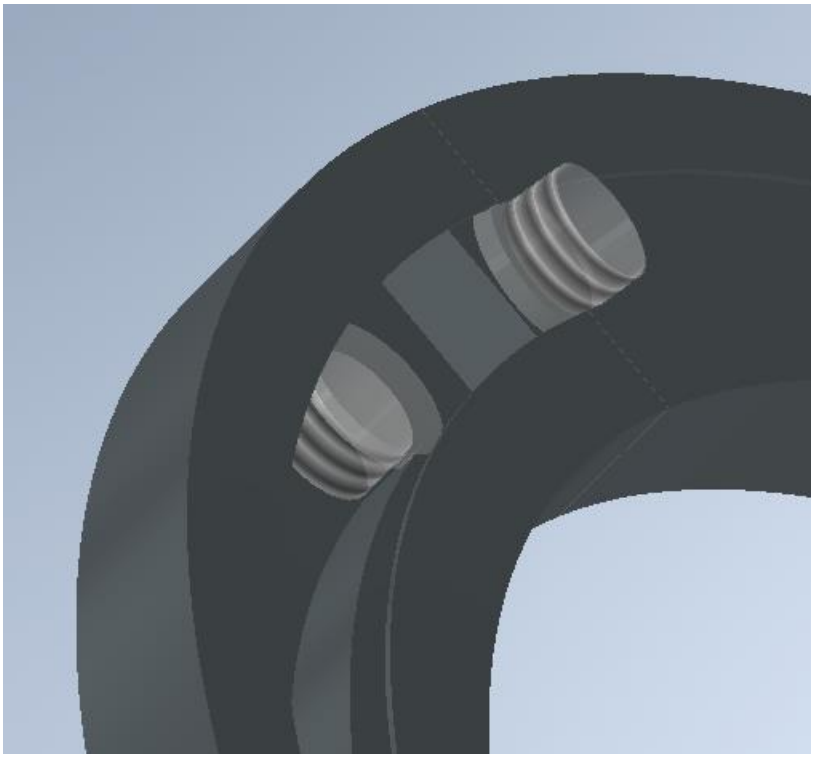

Figure 6-5 The third trap flips push caps from a top-on-bottom to a bottom-on-base position.

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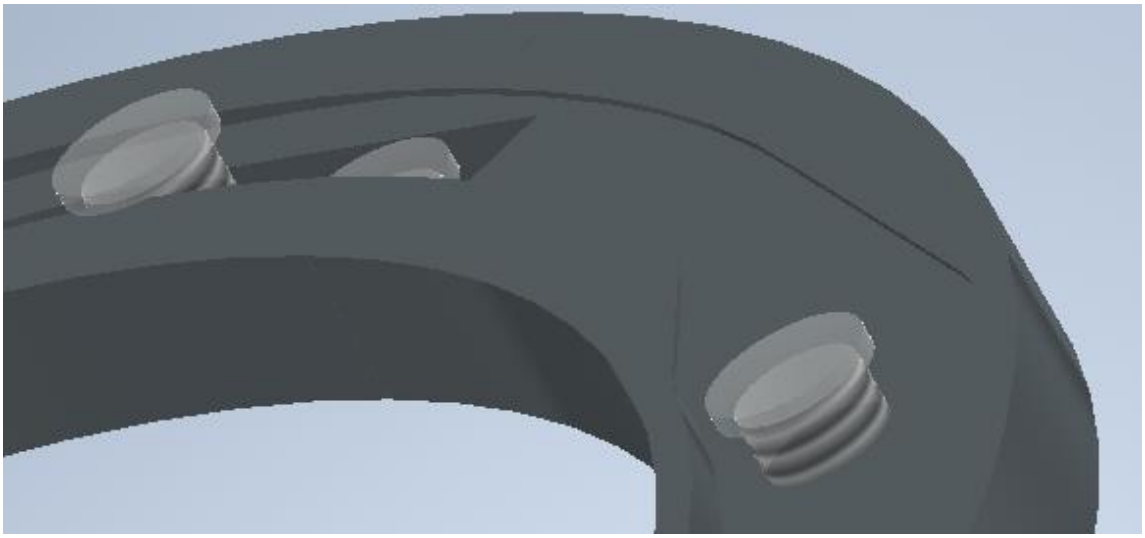

Figure 6-6 The second and the third trap acting to provide the same orientation.

7. WHAT PROBLEMS OCCURRED AND HOW THEY WERE (OR NOT) SOLVED:

- Designing on a curved platform was a challenge as difficulty in creating required features on a curved platform is much more difficult than doing it on a flat platform. I solve the problem by putting in much of the time in designing the feature according to the required dimensions.
- Designing the arch on top of the part was difficult as there were no exact measurements for the arch, so I had to assume the radii and create a curve on top with a value closest to the radii.
- Measuring the arch on top of the part was difficult as there were no exact points or equipment to measure the arch. I measured the arch's height and assumed the radii of a curve relative to that.

8. CONCLUSION:

- Using a Vibratory feeder is an effective way to segregate items into a single orientation.
- This solo project has provided valuable insights into designing objects using Autodesk Inventor.
- The chosen orientation and trap design demonstrate success and offer efficiency and sublimity.
- The design process involved overcoming challenges such as designing, dimensional accuracy and smoother path and implementing solutions for an effective trap design.

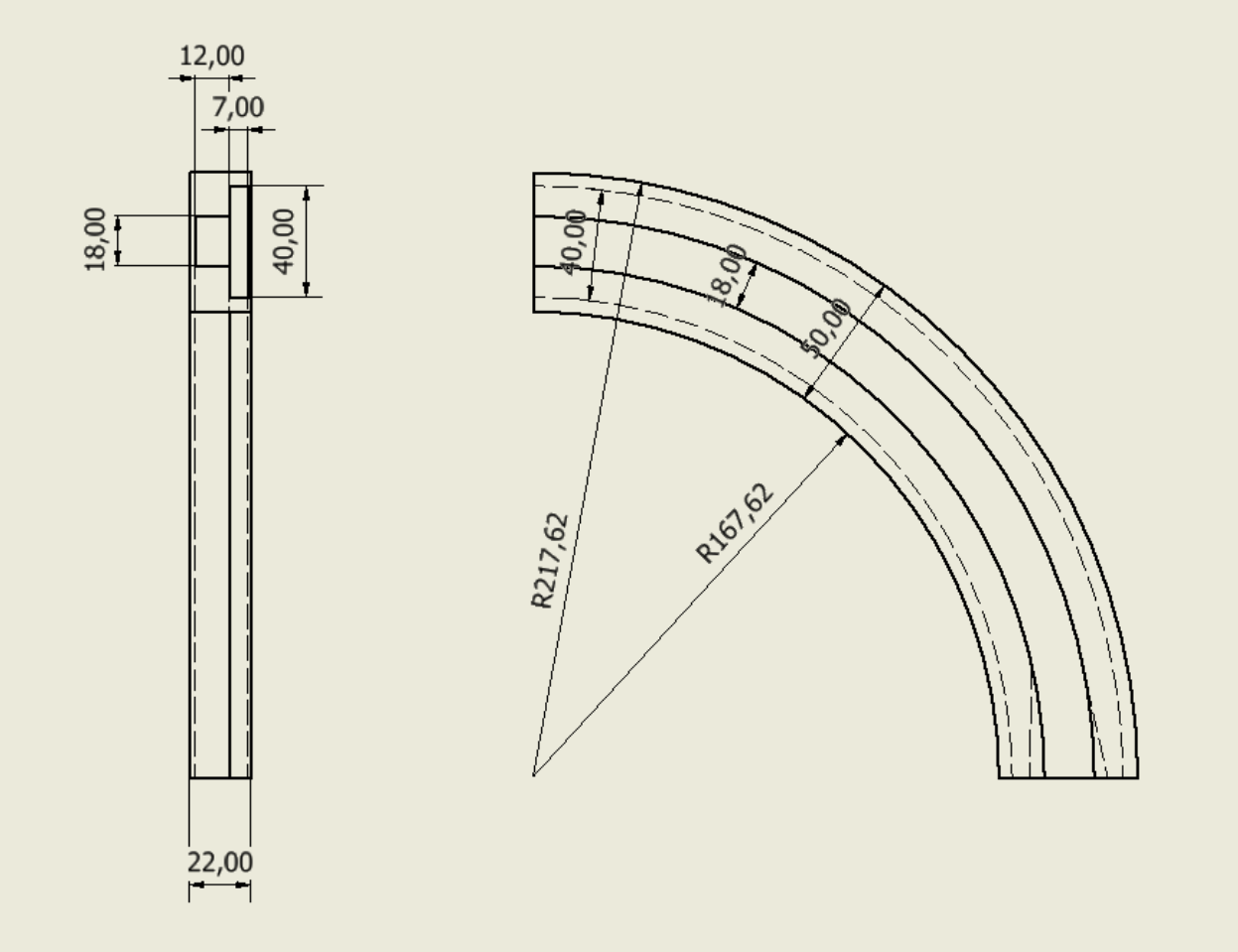

Figure 8-1 2D drawing of the Second part of the Trap Designs

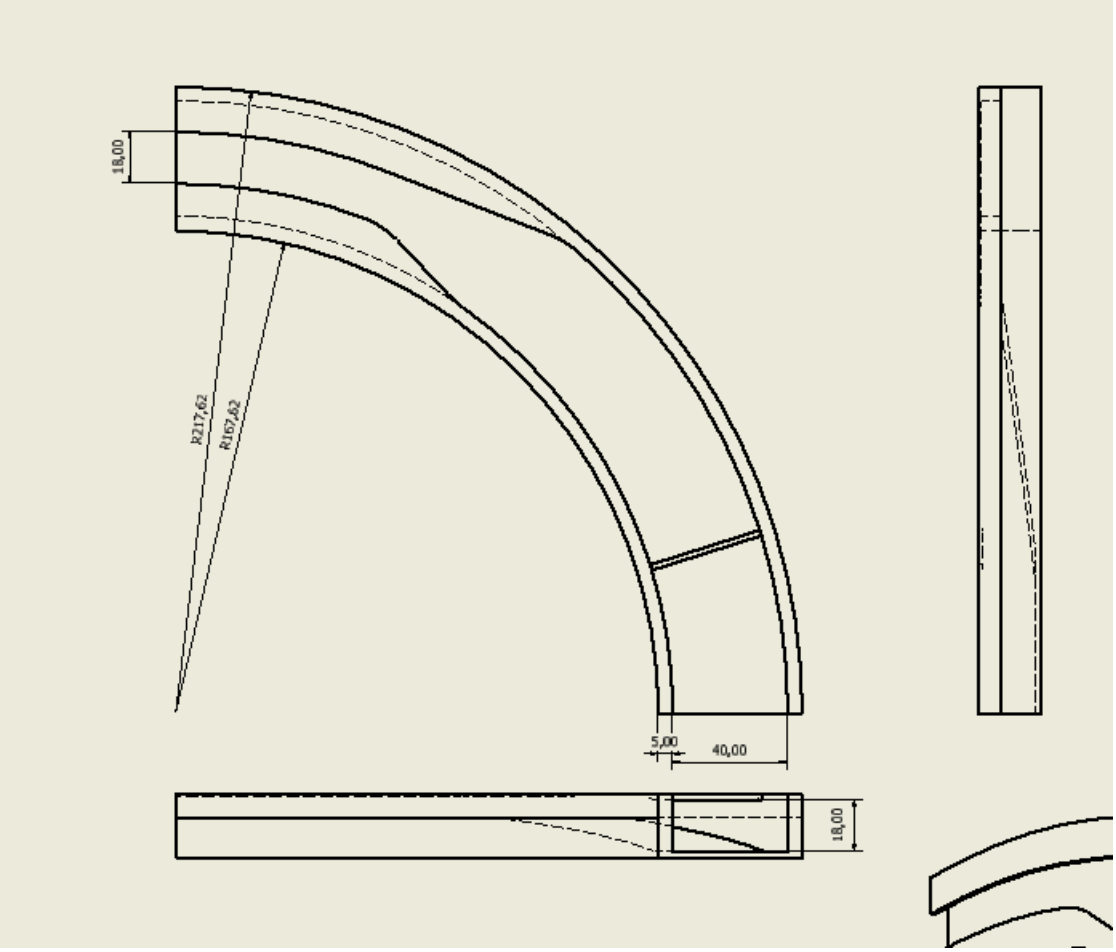

Figure 8-2 2D drawing of the First part of the Trap Designs