

TA201A



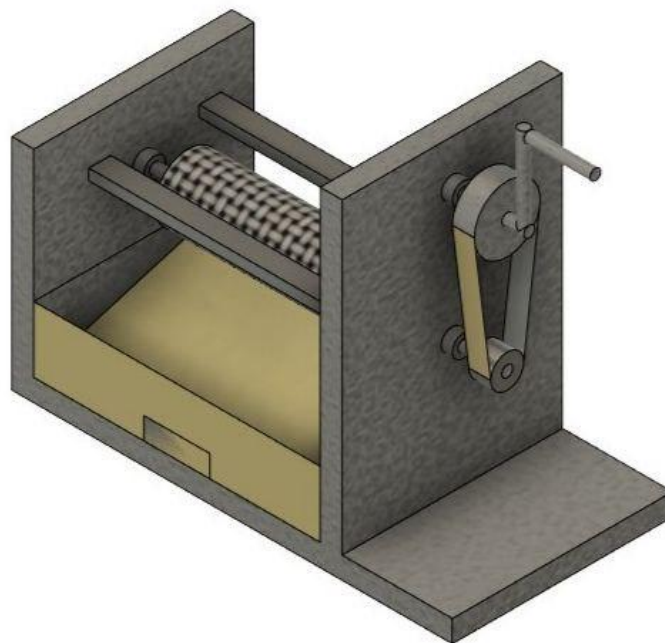
Introduction of Manufacturing Processes-I

Engineering Metallurgy Lab

Section 9 | Group 10

Foot Dust Cleaning Machine

Project Report



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SUMMARY OF THE PROJECT

This project deals with the fabrication of a Foot Dust cleaning machine. The aim of this project is to develop a process for cleaning the foot dust without making our hands dirty . It is completely mechanical .

The main purpose of this is to use in places where we have no option to remove or clean our footwear like hospitals and malls.

This encourages cleanliness and reduces human effort and does not consume electric power.

In this machine, the handle pulley will be rotated manually which in turn rotates the main shaft pulley. Then with the help of ball bearings, the main shaft is rotated making the brush to roll/rotate, which does the job of cleaning the foot, which is placed on the main stand. The dust coming out of the foot is collected in the dust collector placed right below the brush.

INTRODUCTION

Foot Cleaning Machine is a simple machine with a pulley shaft mechanism where we rotate the handle which drives the pulley setup and that rotates the shaft and the brush connected to the shaft. In this way the dust on the footwear gets cleaned and collected with the help of a trash can, which can be removed manually.

People use this kind of machine but they are more electrical based and much more expensive. But here we have modified it and excluded electrical components from it.

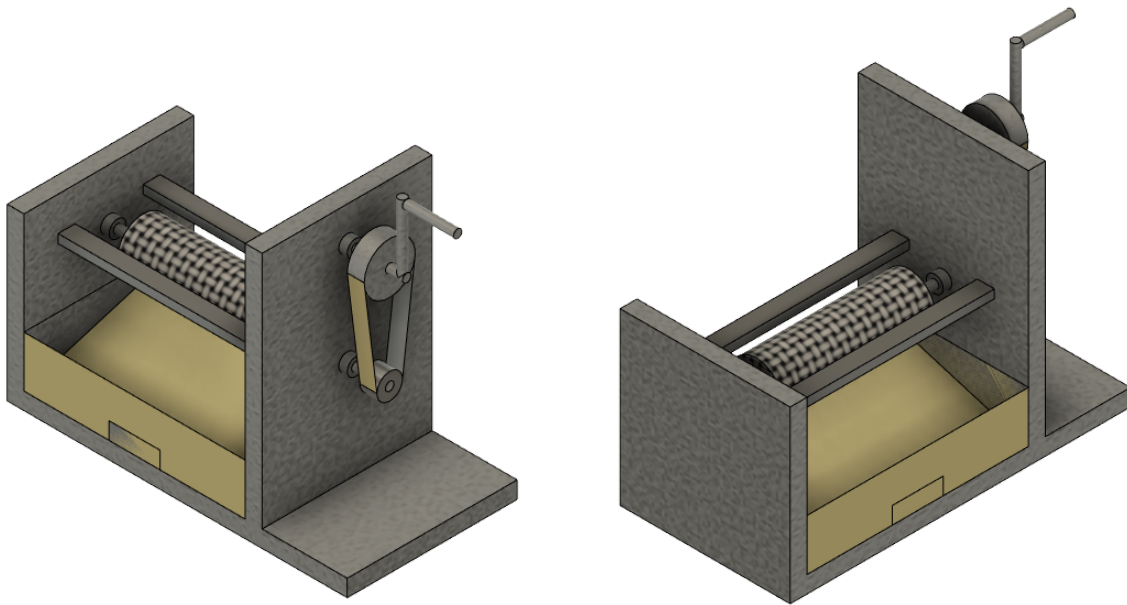
Basically when people go to some public places like malls, hospitals and schools, their footwear might contain dust and they will not be in a position to remove or clean them. From this we got our motivation to come up with a foot cleaning machine. These can be used by children also as we used a very simple mechanism.

Advantages :

- Encourages cleanliness
- Reduced effort
- No power consumption
- Affordable and portable

Applications : Schools
Shopping malls and theaters
Hospitals
Industries and houses as well

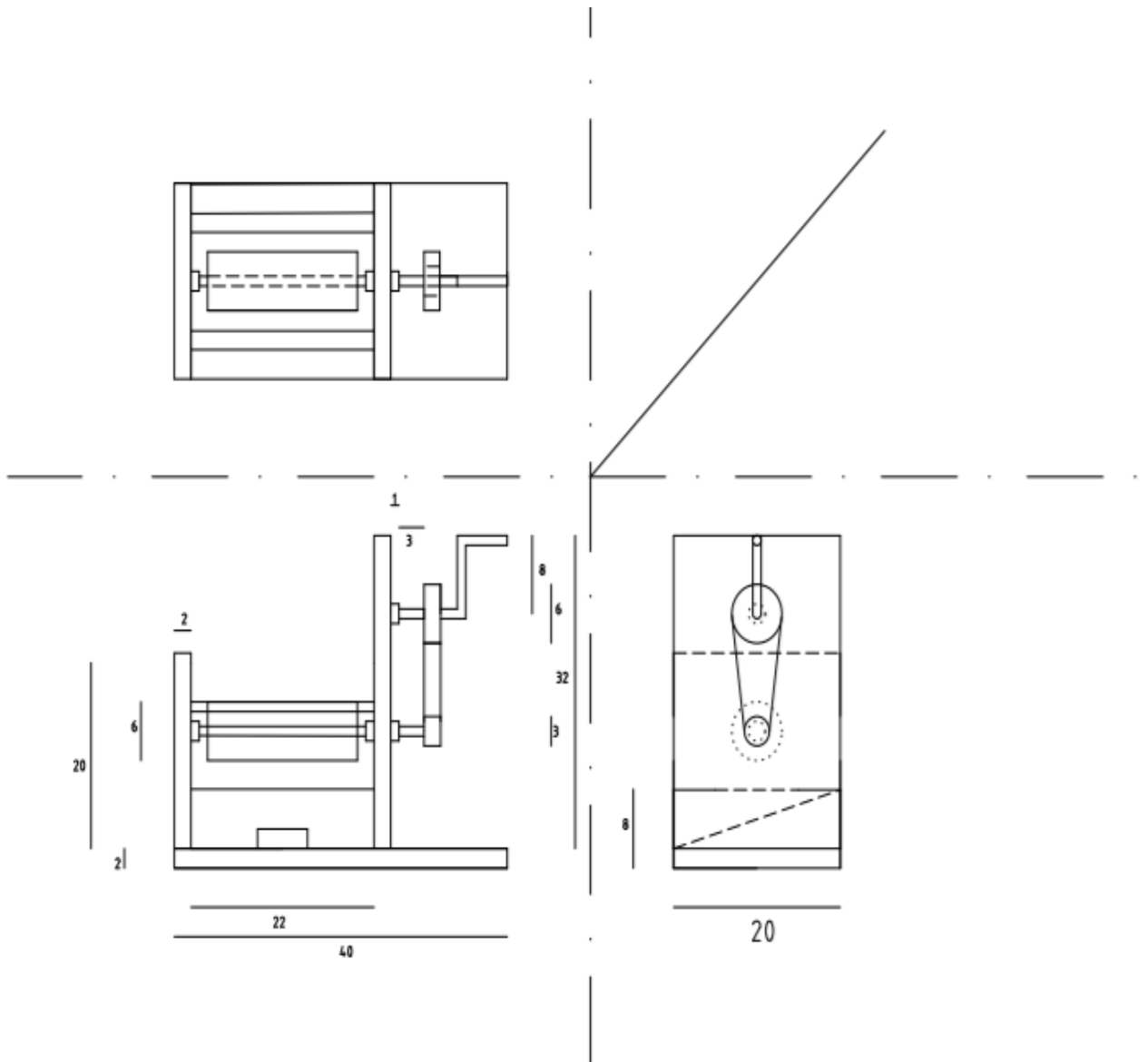
OVERVIEW AND ANIMATION OF THE DESIGN



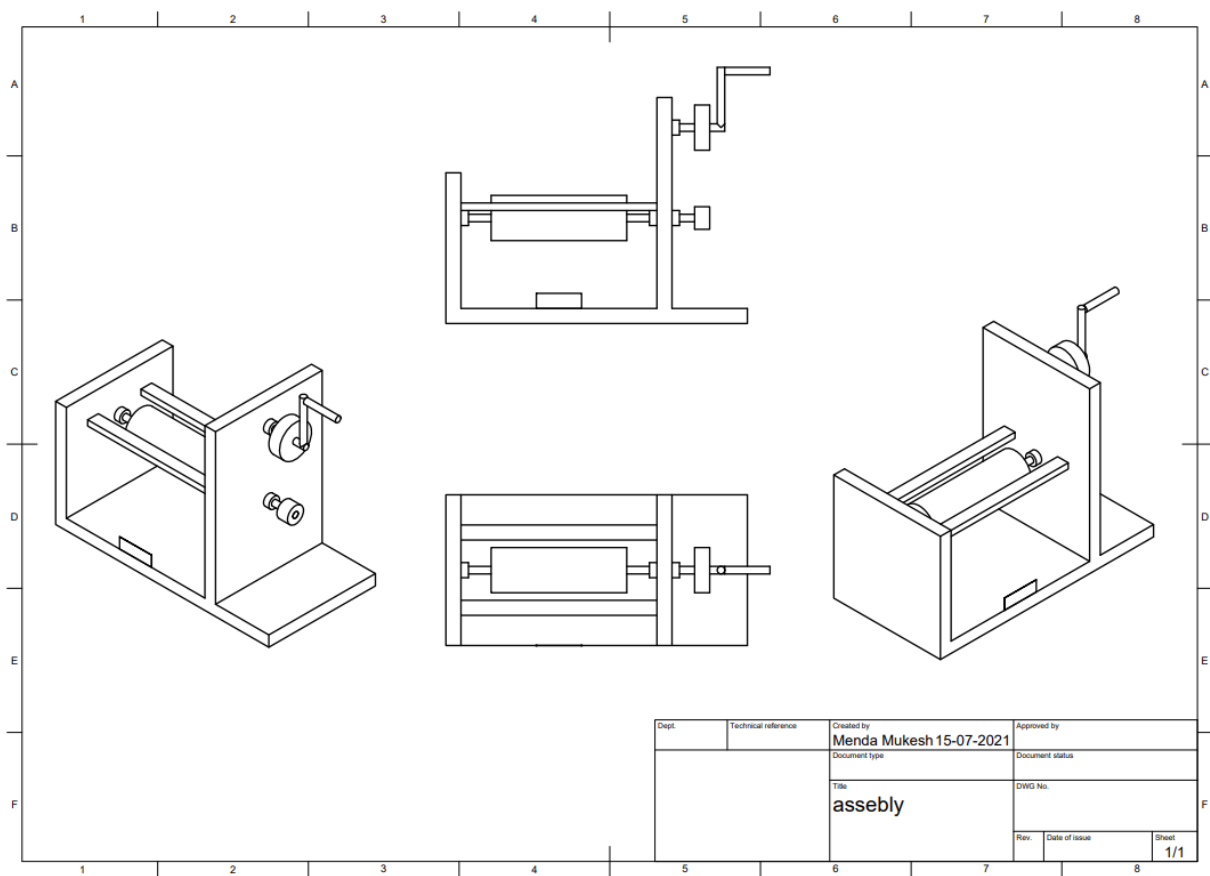
A video of the overview of Foot dust cleaning machine

https://drive.google.com/file/d/1H7Qdr1sMJuREWsDHT_rW0_9Jh48igXVqY/view?usp=sharing

ORTHOGRAPHIC DRAWINGS OF ASSEMBLY



ISOMETRIC DRAWINGS OF ASSEMBLY

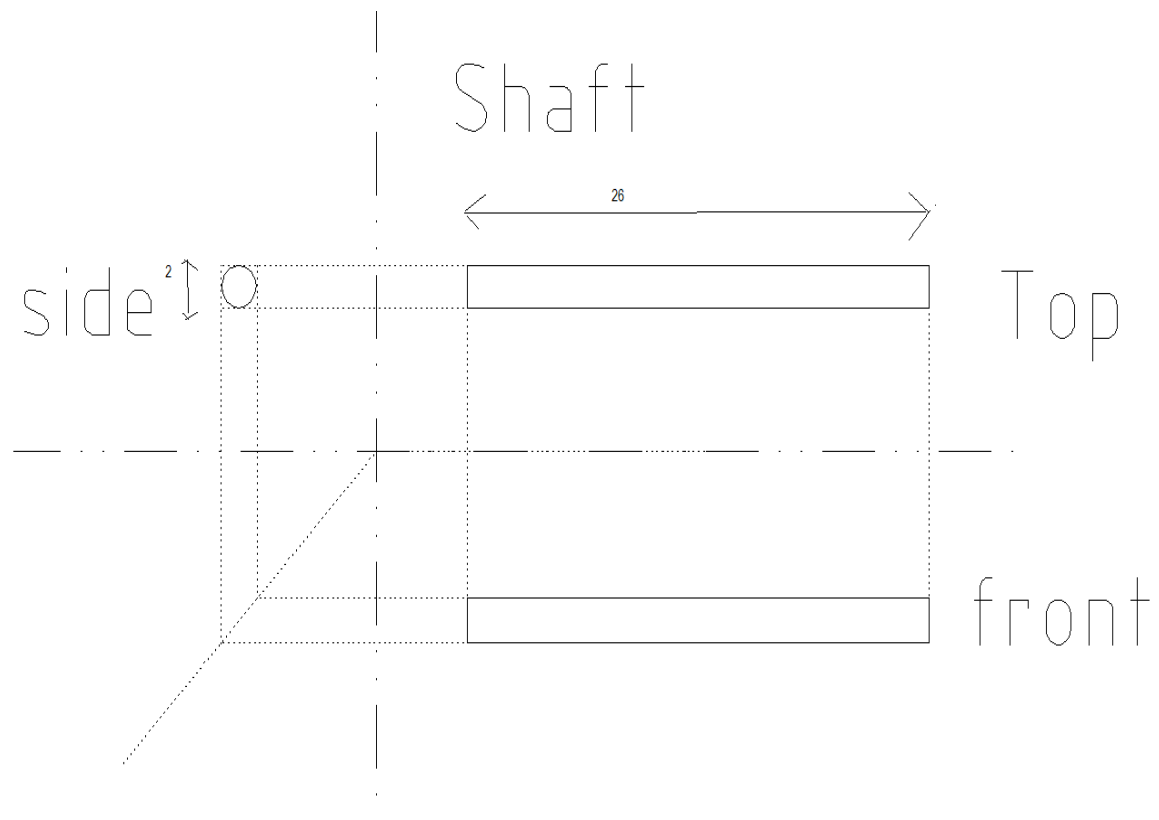


COMPONENTS AND SUB COMPONENTS

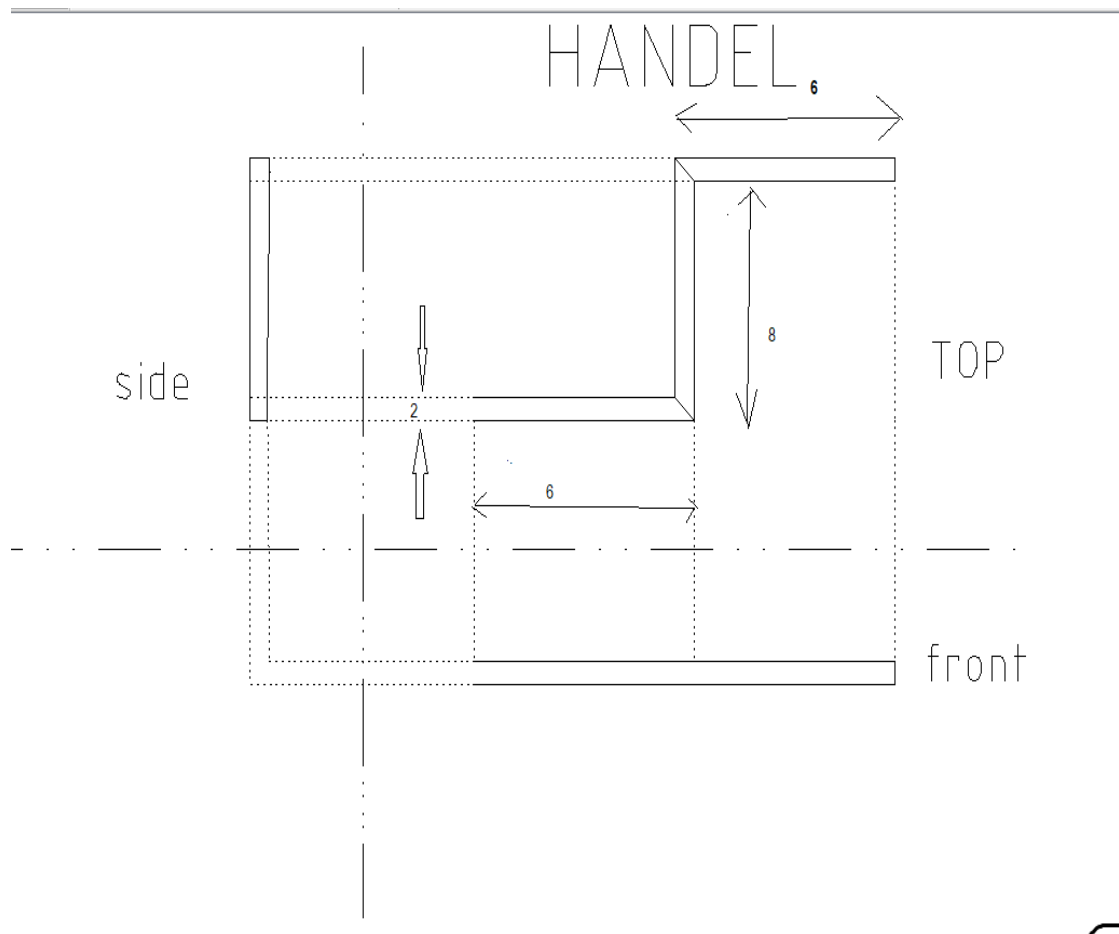
- Shaft Pulley
- Handle Pulley
- Belt
- Trash Box
- Handle
- Main Shaft
- Ball Bearings
- Frame Stand
- Brush
- Foot Stand

DRAWINGS OF COMPONENTS

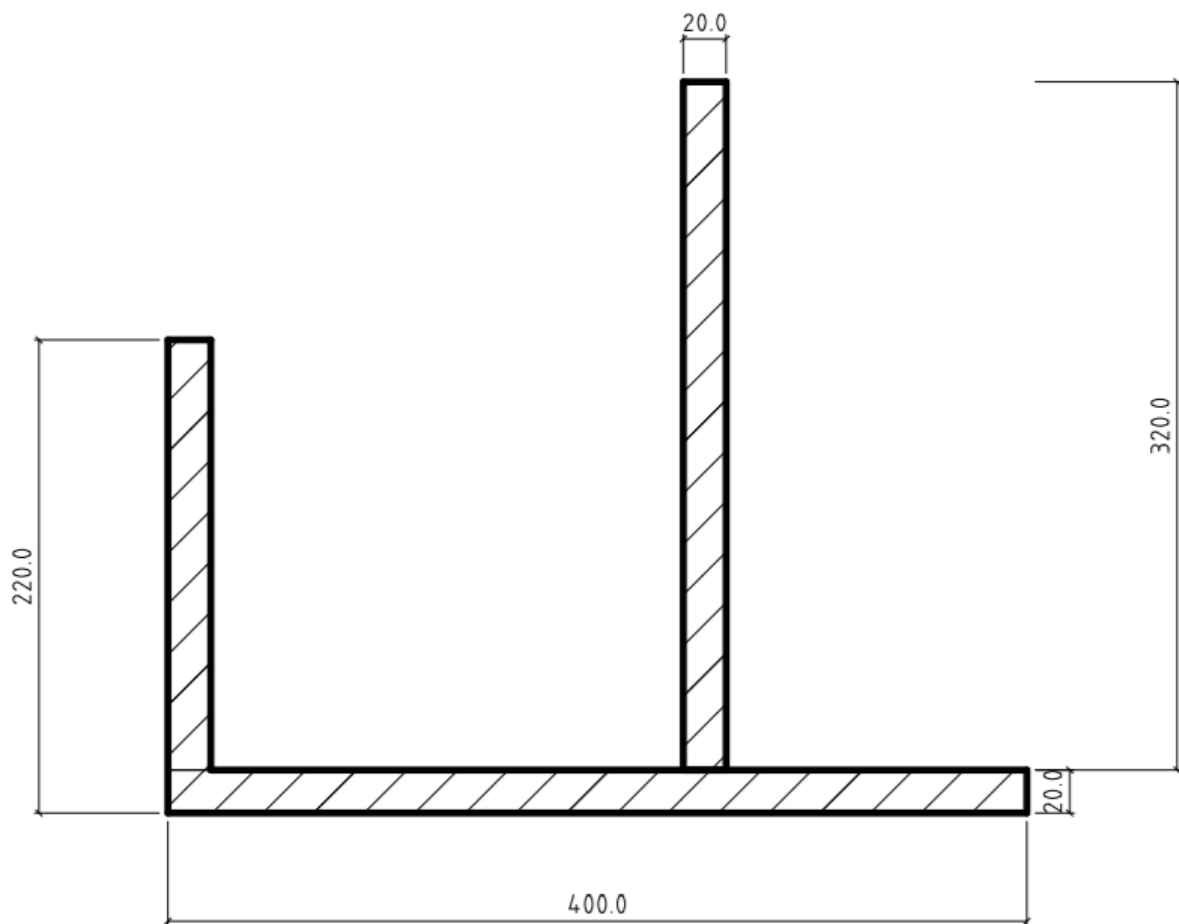
Shaft



Handle

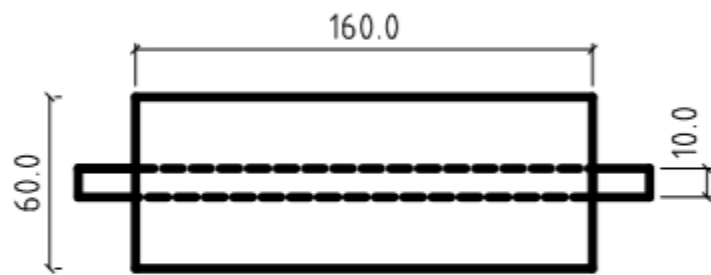


Main frame :



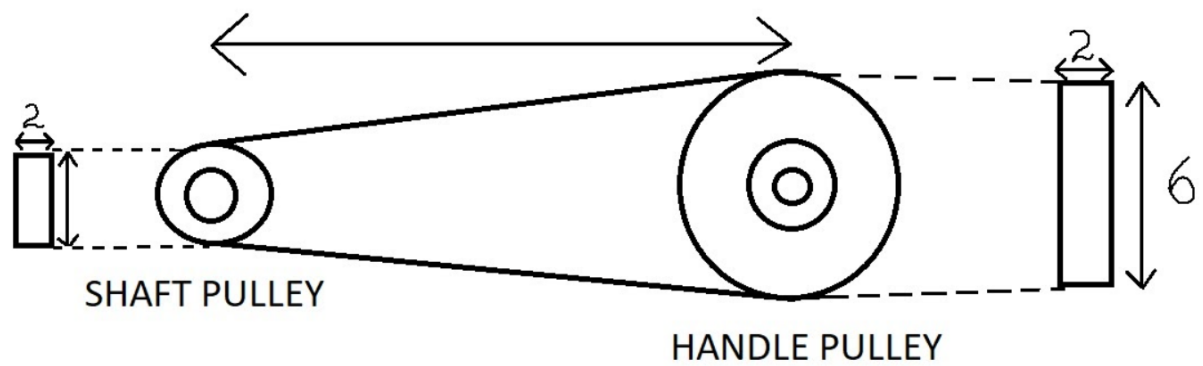
Main Frame

Brush

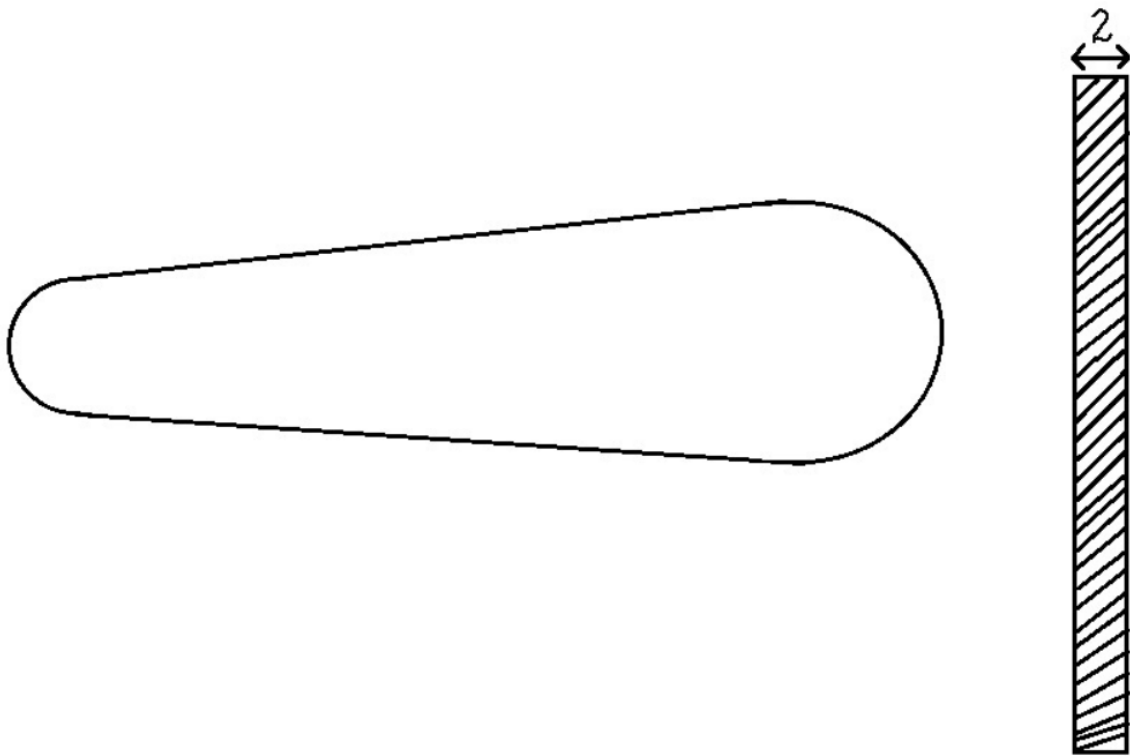


Brush

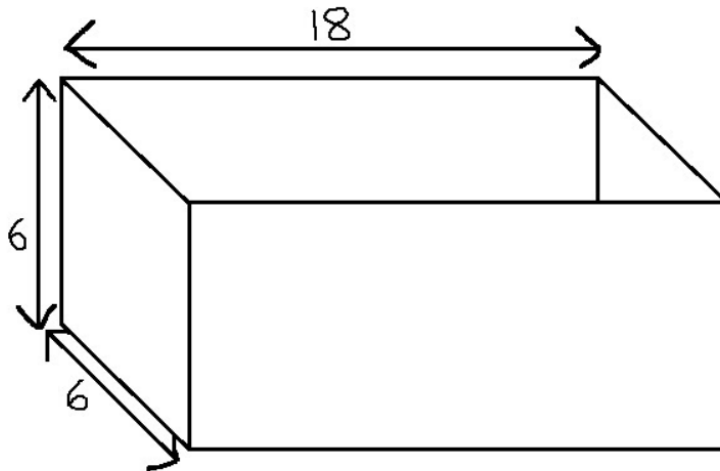
Pulleys



Belt



Trash box



DUST COLLECTOR

MATERIALS USED FOR THE PROJECT

Shaft Pulley

Material used- Stainless steel

Reason-

Because it is corrosion resistant and can withstand low temperature to high temperature weather conditions. It can stay for a long period of time with very less maintenance cost.

Handle Pulley

Stainless steel can be used.

Reason- Because it is corrosion resistant and can withstand low temperature to high temperature weather conditions. It can stay for a long period of time with very less maintenance cost.

Belt

The material used in the belt drive should possess certain qualities; it must be flexible, reliable and durable. Thermoplastics, metal, rubber, fabric and leather can be used.

Trash Box

Trash cans are primarily either made of plastic, metal. Plastic cans include materials like resin and polyethylene. Metal includes stainless steel, steel, and aluminum cans. Here we can use metal cans.

Handle

Stainless steel is a naturally corrosion-resistant,

hard-wearing, and low maintenance material. So, we can use stainless steel for making handles.

Main Shaft

1). Main shaft material includes alloy of nickel, nickel-chromium or chromium-vanadium steel is used.

2). Shafts are made up of nickel and various alloys due to many reasons:

A). In order to maintain that a shaft has to be more tougher and agile.

B). Higher the carbon content in steel makes it more hard and brittle.

3). Alloys of nickel provides good strength, toughness and wear resistance

4). Alloys of nickel also provides high level of machinability.

Ball Bearings

The properties of steel balls of martensitic chrome steel make them especially well suited to ball bearing production, since they make stable components that are resistant and convincingly durable in continuous operation

Frame Stand

- 1). Frame stand should be made up of wood and also we can use aluminium. Alloys.
- 2). Aluminium alloys are very strong and also have high tensile strength.
- 3). Because of ductility, aluminium can be formed into many shapes and profiles.

Brush

Brush can be made up of wire, nylon, polyester, or a combination of these materials.

Foot stand

Material used-
aluminium

Reason- It is very cheap and easily available and lasts for a long period of time.

MANUFACTURING PROCESS USED

Both Pulleys→ Casting

Reason : Casting is a manufacturing process in which a liquid material is usually poured into a mold, which contains a hollow cavity of the desired shape, and then allowed to solidify.Handle

Belt→ Soldering the two flat ends of Rectangular slit.

Trash Box → It can be made easily just by soldering or moulding the material.

Handle → Casting

Main Shaft → It is a cylindrical thin pipe manufactured by just machining a rod.

Ball Bearings → The manufacturing of a ball bearing is much more complex than we can imagine. It requires turning, grinding and assembly.

Frame Stand → Made up of wood. And Shape given by Machines.

Brush → Moulding

Foot stand → Casting

PROJECT TIMELINE AND WORK DISTRIBUTION

Orthographic views :

Yash vardhan , rajit das, kalyan

Isometric views :

Kalyan , mukesh

Part drawings

Shobhit , rahul : pulleys ,belt and trash can

Vivek kumar : handle and shaft

Kalyan and nishant : main frame , brush

Animation

Mukesh

PPT

Summary : shobhit

Materials and manufacturing : prachi,
vivek,Rahul

Writing acknowledgment : rajit

Cost: nishant

Sustainability : Shobhit

Rest of the PPT : mukesh

COST ANALYSIS AND SUSTAINABILITY

Alloy Steel is used in Shaft pulley part, ball bearings and main shaft, so we need approximately 2 kgs and it costs Rs.372
Stainless steel is used in handle pulley and handle, so we need approximately 1 kgs and it costs Rs.195

Thermoplastic Elastomer is used in Belt, so we need approximately .5 kgs and it costs Rs.80

Aluminum metal is used in Trash box, so we need approximately .5 kgs and it costs Rs.40

Wood is used for frame stand and foot stand, so we need approximately 2kg of wood and it costs Rs. 200

Polyester fiber is used in Brush, so we need approximately .5 kgs and it costs Rs.105

Total Cost (Upper end): Rs. 992

Total weight of materials required: 6.5Kgs

SUSTAINABILITY

The sustainability of our working model relies on the materials that are used in manufacturing of all parts. Talking about steel & nickel alloys and stainless steel that we are using for pulleys, handle and main shaft have a lifespan of around 30-50 years. But as the machine will be used on a daily basis the predicted lifespan can be 10 years. Now the predicted lifespan of the thermoplastic elastomer used for the belt is 3-5 years. The aluminum trash-can can last upto

2-3 years but can be replaced easily. The wooden stand can last upto 5-7 years if used properly. The polyester fibre brush has to be replaced every 4-6 months for the better performance of the machine.

The predicted lifespan of the Whole machine according to us is 5-7 years.

REFERENCES OF SOURCES

Shaft Manufacturing | Riten.com

660+ Mechanical Engineering projects New Updated (learnmech.com)

Mechanical and Automobile Engineering Projects Topics Ideas (seminaronly.com)

Sand Casting Process, Defects, Design

(custompartnet.com)

Video sources:

Rulmeca Melco - Pulley Plant - YouTube

Pulley Fabrication Procedure - YouTube

Input Shaft Manufacture with Okuma LB3000
and FeatureCAM - YouTube

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to our tutor Dr. Gouthama and our lab-in-charge Mr. Indra Pal Singh for their support and instruction in this project.

Their support and direction was instrumental throughout the execution of the project. We thank Prof. Anish Upadhyaya, Course Instructor, and Mr. Govind

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Thank you !