KLE Technological University

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A Minor Project Report on

"CUSTOMIZED RANGOLI DRAWING MACHINE"

BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

Submitted by

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2023-2024

School of Mechanical Engineering

K.L.E Technological University,Vidyanagar, Hubballi 580031

CERTIFICATE

This is to certify that Capstone Project entitled **"CUSTOMIZED RANGOLI DRAWING MACHINE"** submitted by **Team A4 to** the **KLE Technological University**, Hubli-580031, towards partial fulfillment for the award of the degree of Bachelor of Engineering is a bona-fide record of work carried out by him/her under our supervision. The contents of project report, in full or in parts, have not been submitted to any other institute or university for award of any degree or diploma.

Prof. Gururaj Fattepur	Dr. B. B. Kottureshettar
Guide	**School Head**

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning the people who made it possible and whose guidance and encouragement has made our efforts successful.

At the outset, we would like to express our deep sense of gratitude for our guide **Prof. Gururaj Fattepur** for making this project report successful through their invaluable guidance at every stage of the project report.

We also thank **Dr. B. B. Kotturshettar** for his encouragement in undertaking the task of this project.

We express our sincere regard and gratitude to our project co-ordinator **Prof Gururaj Fattepur** and course mentors **Prof. Shreeshail** School of Mechanical Engineering, KLE Tech,, Hubli

We also thankful to all faculty members of the Mechanical Engineering Department of KLE Technological University, for helping us directly or indirectly in different stages of our project work.

Student signatures

(Team A4)

Phase wise Contents:

Phase 1

1 Refined problem statement

1.1 Customer: Men And Women of all the age.

1.2 Customer Needs

- Affordable
- Compact size and portable
- Eco friendly and non-toxic
- Light weight and user friendly.
- Maintaining efficiency, reliable and accuracy.
- Maintenance free and durable device.

1.3 Places (Homes, Decoration Team for Events)	Date
• Near NTTF Dharwad	(17/03/2024)
• Kamalapur Dharwad	(17/03/2024)
• Vidyanagar Hubballi	(17/03/2024)

Interviewers: Mahantesh R Aralikatti, Soundarya Nagaraj Koti, Vishwanath Patil.

Visit to Residential of Kamalapur Area

Visit to Residential of Vidyanagar Hubballi

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses	Creates stunning rangoli designs effortlessly. Creating intricate patterns and filling them with colors can be quite time-consuming and requires a lot of patience.	The most important element of Rangoli is being colorful. Rangoli can be made on the floor, sidewalk, or entrances of homes. The materials used can easily be found in your pantry, yard, or a regular grocery store.
	Complex geometric patterns or floral designs with intricate details can be quite challenging to replicate accurately.	The designs are symmetrical and geometry in shaped commonly drawn with lines that may be straight or wavy and rounded on the edges.
	It must be portable and easy to handle for all generation people.	The machine should versatility to work on any surfaces and any materials used (rangoli powder or rice flour).
	It should save time and energy while creating mesmerizing rangoli.	They would prefer a machine that can complete designs within a reasonable timeframe, saving them time and effort compared to manual drawing.
Likes-current methods followed(traditional techniques)	The Rangoli patterns are created manually by hand on the floor using materials such as powdered limestone, red ochre, dry rice flour, colored sand, flower petals and colored rocks.	One challenge is ensuring accurate and precise placement of the materials to create intricate designs.
	The process begins drawing an outline using chalk. This is followed by design with colors or materials of choice.	Another challenge is designing a machine that can handle various types of materials, such as colored powders or grains. Additionally, the machine should be able to handle different sizes and shapes of rangoli designs.
Dislikes-current methods followed (traditional techniques)	One of the most common mistakes is creating uneven or mishappen patterns due to lack of symmetry.	Complex drawings can be drawn in shorter time with accuracy.
	Inconsistencies in the lines or shapes of the design can make the rangoli appear messy or poorly executed	It should carry the Consistency in the lines and shapes of the design can enhance the appearance of the rangoli, lending it a polished and well-executed look.
	Not planning the design properly before starting can result in a rangoli that lacks coherence or structure.	Thoroughly planning the design beforehand ensures a rangoli that exudes coherence and structure, avoiding any lack of clarity or disorganization.
	Accidentally smudging or spilling colors while filling in the design can ruin the overall appearance of the rangoli	The ability to create intricate and beautiful designs by filling the different colors of powder.
Suggested Improvements	It must be eco-friendly. Implement safety features to prevent accidents.	Materials used for machine should be non-toxic
	It must be less expensive and easy maintenance.	Purchasing low cost materials with quality.
	Portable Device.	Using lightweight Materials.

1.4 Requirements List

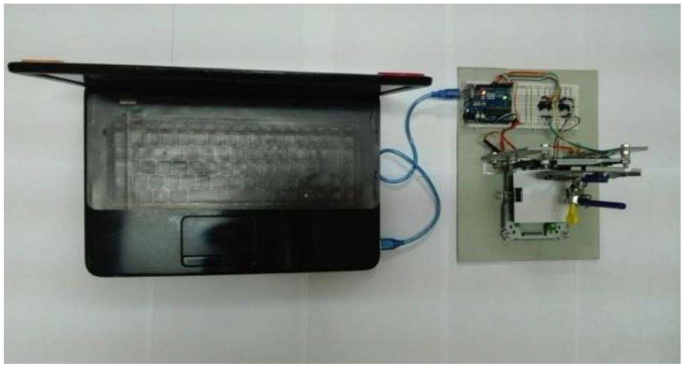
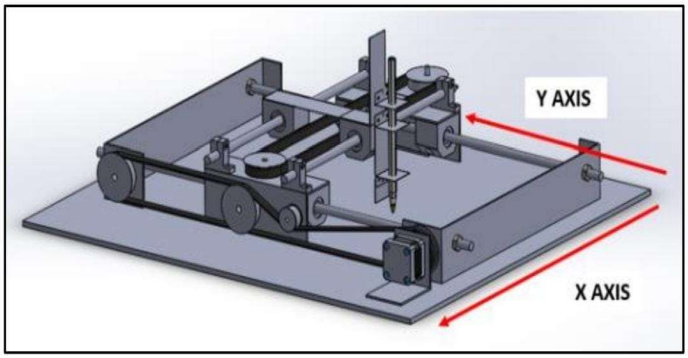
Customer	Requirements
Women, Men, Event Management, Purohit of temples.	Ease of user interface.
	Maintenance free and durable device.
	Eco friendly and non-toxic.
	Compact size and portable.
	Light weight and user friendly.
	Maintaining efficiency, reliable and accuracy.
	Affordable

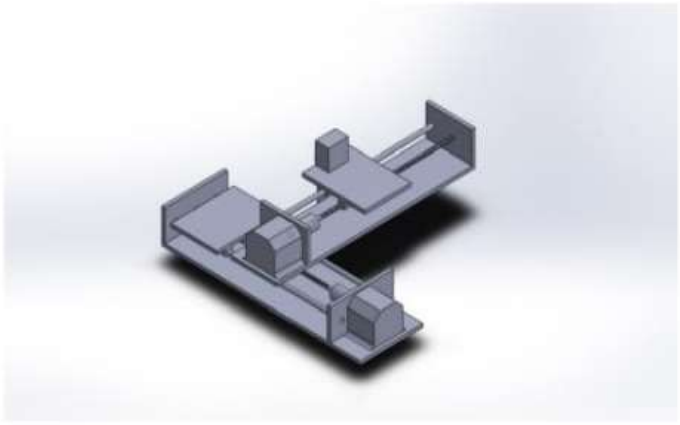
Visit to Residential of NTTF Area

Visit to Residential of Kamalapur Area

Visit to Residential of Vidyanagar Hubballi

2.2 Patent Search

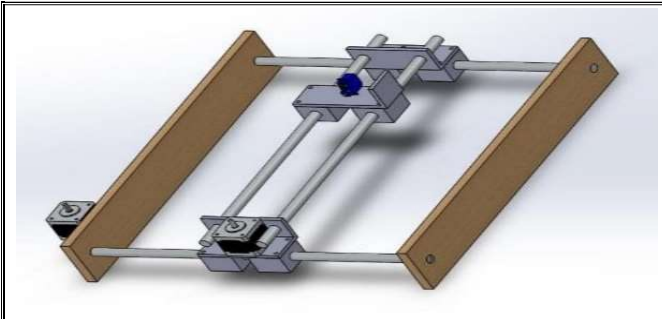
Patent Name/ Number/ Date	Information
Title: Microcontroller – Based Plotter Machine International publication number: Vol.21 No.3, 0218 pp.350 – 355 Date: 30-April-2018 	The main idea behind this paper is to design and implement a cheap, smaller size, easily operable, easy interface and flexible 3-axis Computer Numerical Control (CNC) plotter machine. The lower cost is achieved by using 2 CD drives from old PC's with their stepper motors as the main structure for the hardware. The two stepper motors already found in the CD drives used to control the pen movements onto X and Y axis and one servo motor on the Z axis. An Arduino Uno microcontroller is used to controls the proper synchronization of these three motors during printing/drawing process. The motors winding voltages were displayed on the oscilloscope during the printing process to investigate the synchronization between the three motors. The design of the circuit is simple, inexpensive and can be accomplished using commercially available components
Title: Development of a Two-Dimensional Plotter International publication number: 2010, vol. 5, pp. 481-485: Date: Annual Conference 2018 - Sri Lanka Network 	Two-dimensional plotter concept has been used in many applications since a long time. Plotters are controlled by computer. Plotter is a device which do drawings according to the given coordinates. Most popular XY plotter designs are two axis manipulators, stepper motors included, and timing belt driven mechanisms are included. Main applications of plotter are CNC machine, engraving machine and drawing machine etc. XY plotter operates in two perpendicular axes of motion in order to provide two independent movements and drawings. These type of plotting mechanisms normally use stepper motors as it is easy to achieve accuracy unlike DC motors. In drawing applications, usually image processing tools are involved to perform edge detection, noise removal and mapping etc. There is image processing software available which supports advanced processing methods such as OpenCV,

	MATLAB. Different types of plotters are being used commonly such as cutting plotters, XY writers, electrostatic plotters, drawing machines etc.
Title: Design and fabrication of dual axis writing machine International publication number: doi:10.1109/ICECCO.2014.6997578 Date: 14 December 2020 	Writing is one of the most important modes of communication that is an essential element in our day-to-day life, but for some people it is an impossible task due to their disabilities. Drawing an image nowadays is done using various technologies. Computer Numerical Control (CNC) writing machine sketches picture controlled by a computer system. In this work a low-cost CNC based writing machine is designed and fabricated to ease the difficulties. To design this model three axis controlling unit is needed to control X, Y and Z axis position. X and Y axis can be controlled by two stepper motor and Z axis can be controlled by servo motor. The Dual axis writer helps in performing the writing task with the help of a 2-axis setup using lead screws and stepper motors. The stepper motor aids in accurate writing and designing of required shapes and letters. The objective is to design and fabricate a simplistic model of CNC writing machine and to reduce the cost of the machine. 2020 Elsevier Ltd. All rights reserved. Selection and peer-review under responsibility of the scientific committee of the International Conference on Mechanical, Electronics and Computer Engineering 2020: Materials Science.
Title: XY PLOTTER International publication number: Doi: SBN: 978-93-88350-20-4 Date: 27th - 28th September, 2018	The robotic X-Y plotter is robot which offers a fastest way to powerfully produce very large drawings. This Robotic X-Y Plotter which is basically centred to the vector graphic device, wherein the robot designs or sketches the input given from the computer on the drawing board or a sheet of paper using Arduino UNO microcontroller on a open-source physical computing platform Arduino IDE software. The board is fed with polarograph server Arduino based program which is required for the accurate

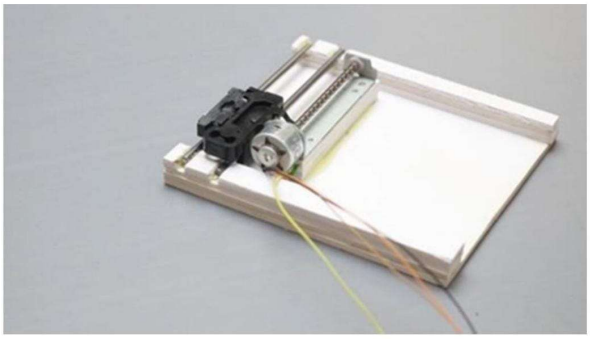
	diagram, and thus with the aid of processing software (version 1.0.5) in which polarograph libraries are uploaded, the robot starts sketching. The X-Y robotic plotter, as the name suggests has a two-axis control (i.e. X and Y axis), and a distinctive mechanism to lift up and lift down the pen. Each axis is drove using a single servo motor. Pen control is achieved using a servo, and the flexibility of this motor which is suspended and attached through GT2 pulley belt, is controlled by the two-stepper motor fixed at the corner of the board or sheet of paper. This arrangement allows the robot to perform tasks at a good pace and with increased accuracy.

2.3 Literature survey

Literature details	Gathered Information
Title: Plotting with Thread: Fabricating Delicate Punch Needle Embroidery with X-Y Plotters Author: Eytan Adar, Shiqing He Source: http://eyesofpanda.com/projects/thread_plotter Date: July 6–10, 2020	Punch needle embroidery is a unique type of embroidery that uses loops of threads to create designs. Technology for punch needle embroidery ranges from popular handheld manual tools to high-cost industrial tufting machines. Computer-controlled punch needle fabrication tools remain out-of-reach for most practitioners. In this work, we describe how a low-cost X-Y plotter can be repurposed to support punch needle embroidery fabrication. By adding easy-to-make physical accessories coupled with a novel software toolkit, we support the production of delicate and precise punch needle embroideries with minimal manual labour.
Title: Implementation of Arduino UNO based Two Directional [2D] Plotter Author: Sheetal N. Patil, Prashant G. Patil Date: Mar 2019	A 2D PLOTTER machine generally consists of a computer-controlled servo-amplifier, servo-motors, spindle motor, and various tooling. The machine can be programmed to shape a part by use of a front control panel. More sophisticated models allow a computer-aided design drawing to be uploaded to the machine. The electronic components within a 2D PLOTTER machine are particularly sensitive to the grounding



techniques used in the electrical supply to the machine. Malfunction, degradation, and damage to the electronics can often be traced to supplemental ground rods and lightning strikes to earth. Production downtime, product loss, and expensive repair bills result. With the wide-spread use of 2D PLOTTER machines across the world, these problems have become a significant financial concern to many 2D PLOTTER machine users and their electric utility companies. This paper begins with a brief explanation of the fundamentals of service and equipment grounding. The basic design of 2D PLOTTER machines is also explained. Based on a survey of several 2D PLOTTER machine representatives, the paper will explore the common grounding techniques recommended by many 2D PLOTTER machine tool builders with particular emphasis on the ground-rod problem. In addition, several actual case studies that support the ground-rod problem will be described. Finally, a recommended powering and grounding practice is presented to help eliminate power quality related operating problems with 2D PLOTTER machines while maintaining the safety requirements of electrical codes.

Title: Development of two-dimensional plotter using programmable logic controller and human machine interface Author: Priya Khanduja1, Harshita Bhargave2, Atul Babbar3, Pankaj Pundir1, Ankit Sharma1 Source: Journal of Physics: Conference Series Date: 2021	In this modern world, the use of computerized numerical control technology has become indispensable in the areas of logo designing, furniture, and marble industries, etc. It inspires authors to develop the two-dimensional Plotter device using Programmable Logic Controller (PLC) and Human Machine Interface (HMI) to reduce the complexity of CNC machines. The functional application of X-Y axis-based Plotter is used to draw a variety of shapes, text, and images on the solid surface. In this study, ladder programming is performed according to the script, and the program is thus executed by PLC which further gives the signal to the actuators. The X-Y axis is controlled by servo drivers which drive servo motors. DC motor is used to decide the position of the pen. Human Machine Interface (HMI) is used to provide supervisory control to the X-Y plotter. It has been achieved that the implementation of PLC-HMI based control panel gives comfortable and secure control
Title: Low-Cost Speech to Text Translation Handwriting Robot using Arduino and Google API Author: Ramya M V1 and Sanjay S Tippannavar Source: Available: www.ijraset.com Date: 5, May 2018 	Among all forms of communication, writing is the most popular and universally recognised. Writing proficiency is thus crucial for reaching professional and corporate objectives. Unfortunately, it could be difficult in unique situations involving persons with varied abilities. The solution is to carry out the writing job utilising a robotic arm (SCARA). Writing an alphabet in both English and a regional language will be made possible by automation. The hardware and software requirements for building a robot that can do a task that is typically completed by a portable pen are covered in this paper.

Phase 3

3.1 Brainstorming

Keywords	
Durability	No leakage of powder
Reliability	Avaliability of materials
Non Toxic	Robotic Arm
User Friendly	Rangoli Powder
Light Weight	Degree of freedom
Accuracy	Complex geometric patterns
Low Cost	Quality
Compactable	Less time consumption
Precision	Safety
Less Maintainence	Good resistance
No sharp edges	Non Conductor of electricity
Good Quality Wires	Bad absorber of moisture
Motor Life	Floow control of powder
Portable	Flexibility
Affordable	Scalibity
Eco Friendly	Consistancy
Ease of user interface	Customization
Non Corrosive	Accessibility
Easy to repair	Design
Good Battery Life	Strength

3.2 OFMC Chart

Keywords	Objectives	Functions	Means	Constraints
Durability	✓			
Reliability				✓
Non toxic	✓			
User friendly	✓			
Light weight				✓
Accuracy	✓			
Low cost	✓			
Compactable				✓
Precision	✓			
Less maintaince				✓
No sharp edges				✓
Good quality Wires			✓	
Motor Life			✓	
Portable				✓
Affordable	✓			
Eco friendly	✓			
Efficiency	✓			
Ease of user interface		✓		
Non corrosive			✓	
Easy to Repair				✓
Good battery life			✓	

Strength				
No leakage of powder		✓		
Availability of materials				✓
Robotic Arm			✓	
Rangoli powder		✓		
Degree of freedom			✓	
Complex geometric patterns		✓		
Quality	✓			
Less Time consumption		✓		
Safety				✓
Good resistors			✓	
Non-Conductor of electricity				✓
Bad absorber of moisture				✓
Flow control of powder		✓		
Flexibility	✓			
Scalability	✓			
Customization	✓			
Consistency	✓			
Accessibility				✓
Design			✓	

3.3 Objectives

Objectives	
Durability	Eco friendly
Non toxic	Efficiency
User friendly	Quality
Accuracy	Flexibility
Low cost	Scalability
Precision	Consistency
Affordable	Customization

3.4 Constraints

Constraints	
Reliability	Easy to Repair
Light weight	Availability of materials
Compactable	Safety
Less maintenance	Non-Conductor of electricity
No sharp edges	Bad absorber of moisture
Portable	Accessibility

3.5 Means

Means	
Good quality Wires	Good battery life
Motor Life	Degree of freedom
Non corrosive	Good resistors
Good battery life	Design

3.6 Function

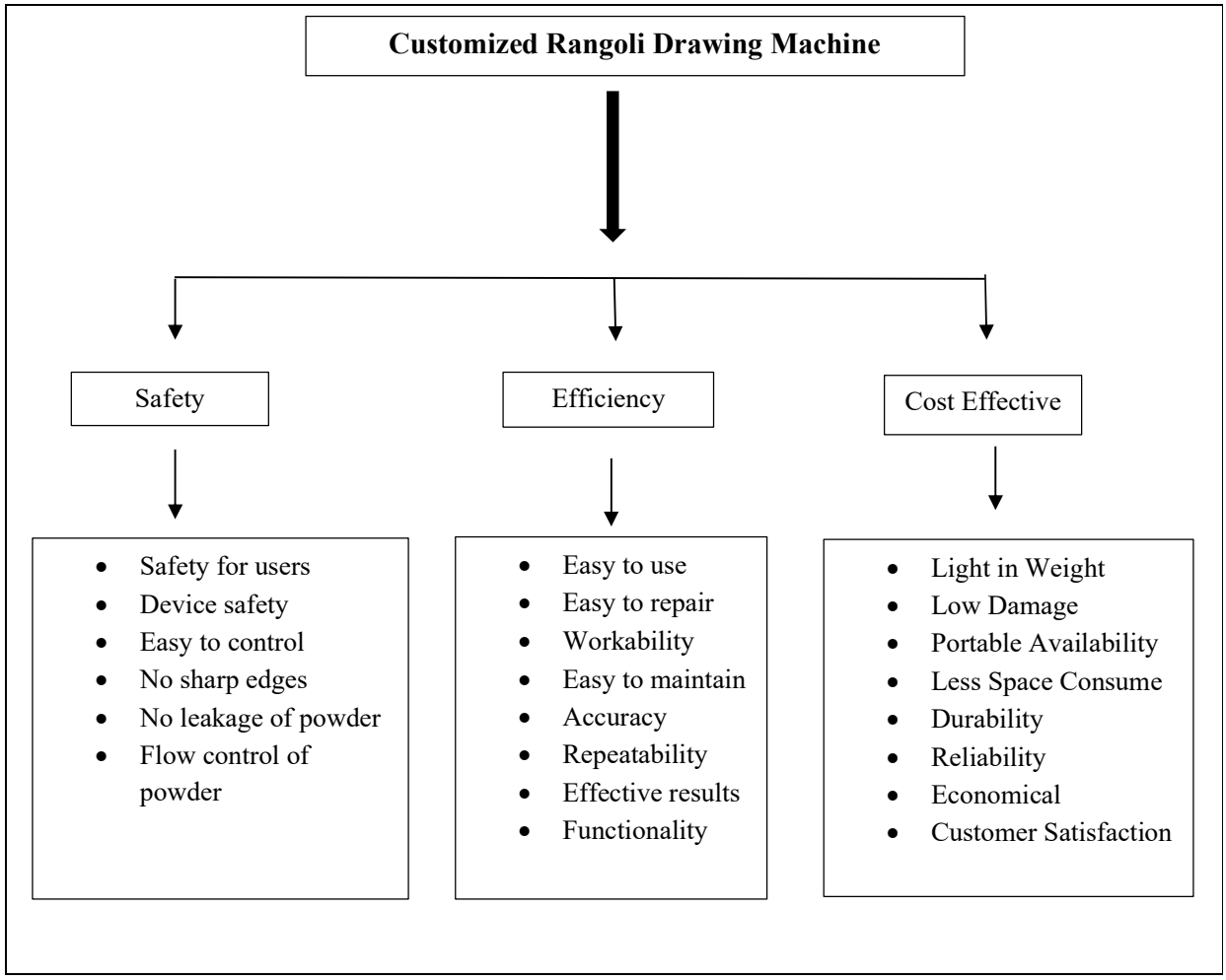
Function	
Ease of user interface	Complex geometric patterns
No leakage of powder	Less time consumption
Rangoli powder	Flow control of powder

3.7 Objective tree (affinity diagram)

O#	Objectives	First level objectives	Second level objectives	Third level objectives
1	Safety	✓		
2	Device safety		✓	
3	User safety			✓
4	Easy to control		✓	
5	Effective results	✓		
6	Flow control of powder		✓	
7	Repeatability			✓
8	Portable availability		✓	
9	Customizable, accuracy		✓	
10	Economical			✓
11	Regular usage	✓		
12	Low maintanence		✓	
13	Functionality	✓		
14	Durability			✓

15	Reliability			✓
16	Workability	✓		
17	No sharp edges			✓
18	Low maintanence		✓	
19	Light in weight	✓		
20	Less space	✓		
21	Customer satisfaction			✓

3.8 Objective tree:



3.9 Design Specifications:

Si.	Engineering Specifications	Units
1	Overall dimenstions	mm
2	Amount of powder used	gram
3	Speed	rpm
4	Overall Weight of machine	kg
5	Material of powder that can be used	Calcite, Limestone or Cereal Powder
6	Flow rate	mm/min

3.10 Competitive Benchmarking:

Sl.NO	Metric	Units	Competitive Products		
			Product 1 **CNC XY PLOTTER**	**Product 2** **XY PLOTTER**	**Product 3** **RANGOLI MACHINE XY PLOTTER**
1	Dimensiion	mm	140*180	240*290	280*320
2	Mode of working	-	Automatic	Automatic	Automatic
3	Number of motors	Nos	3	2	3
4	Power supply	watt(W)	12-15	10-12	12-15
5	Layout	-	Horizontal	Horizontal	Horizontal
6	No of shap edges	Nos	14	18	20
7	Display	-	NA	NA	NA
8	Body Material	-	Nylon	Carbon Fiber, Aluminium	Acrylic
9	Types of holding	-	Pen, Pencil	Pen, Pencil	Rangoli, Pen, Pencil
10	Power source	-	Electric	Electric	Electric

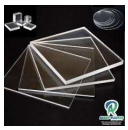
Phase 4

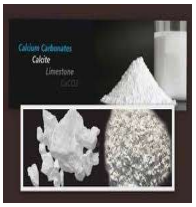
4.1 Concept Generation

Defining Functions

Sl.No	Functions
1	Material for Rangoli Machine
2	Storage Of rangoli powder
3	Flow of powder
4	User interface
5	Type of motor for drive
6	Type of control
7	Mechanism of machine movement
8	Type of powder
9	Type of fixing of powder container
10	Type of Power Source

4.2 Morphological Chart

Functions / Means	Mean 1	Mean 2	Mean 3	Mean 4	Mean 5
Material For Machine	Acrylic Sheets 	Wood 	Polymers 	PETG 	Metals 
Storage and flow Of Rangoli	Stencil 	Plastic Bottle 	Glass Tube 	Squeeze Bottle 	Syringe 
User Interface	Mobile 	Tablet 	Computer 	Smartwatch 	Laptop 
Type of Motor For Drive	DC Motor 	Stepper Motor 	Servo Motor 	Spindle Motor 	Linear Motor 
Type Of Controller	Arduino Nano 	Arduino Uno 	Arduino Mega 		

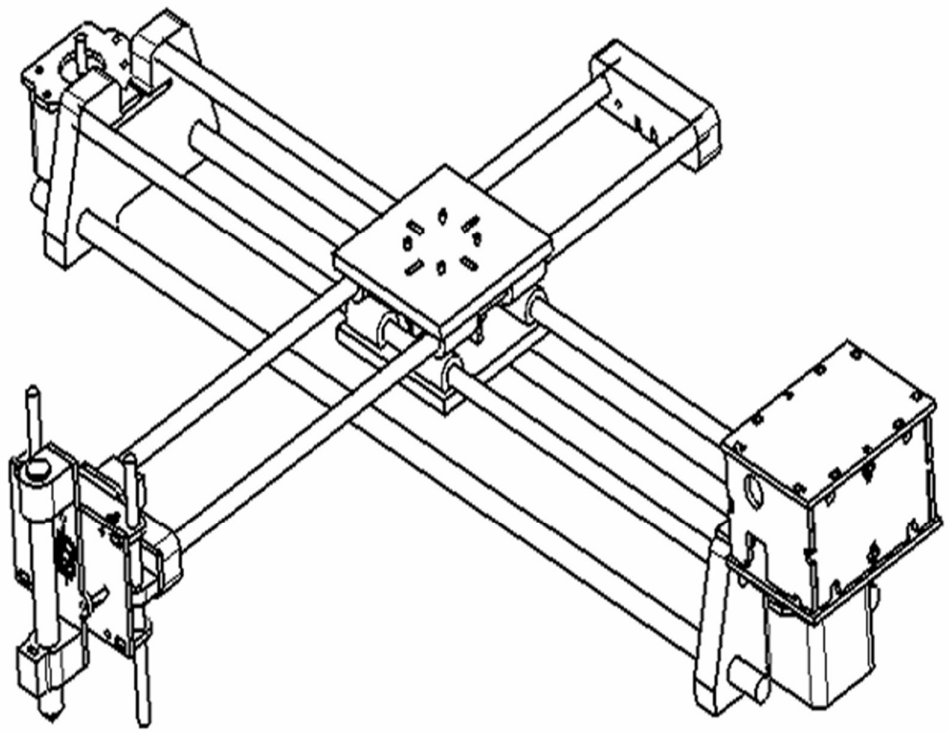
Mechanism of machine movement	**Slider** 	**Conveyor Belt** 	**Gears** 	**Chain** 	
Type of powder	**Rangoli Powder** 	**Cereal Flour** 	**Calcite** 	**Limestone** 	**Chalk Powder** 
Type of fixing of powder container	**Clamps** 	**Split Ring** 	**Nut and bolt** 		
Type of Power Source	**DC voltage** 	**Battery** 	**Solar** 	**Cell** 	**USB** 

4.3 Generating Design Alternatives

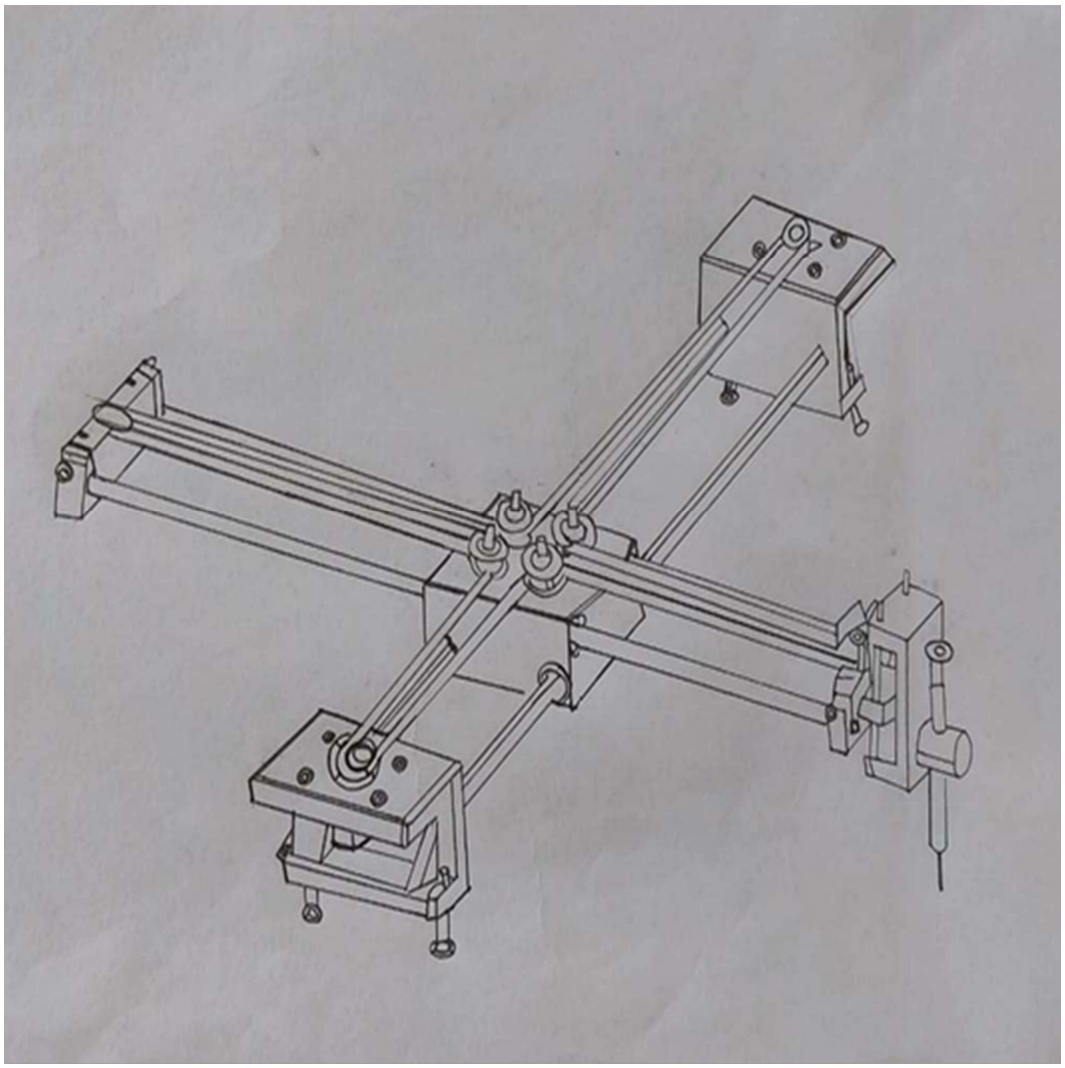
Identified Design Alternatives

Sl.No	Design Alternatives
1	Acrylic Sheet,Stencil, Mobile, ,Stepper Motor,Arduino Uno,Conveyor Belt,Rangoli Powder,Clamps,USB
2	Wood,Stencil,Laptop,DC Motor,Arduino Uno,Slider,Chalk,Clamps, USB
3	Acrylic Sheet,Syringe,Tablet, Spindle Motor,Arduino Uno,Slider, Rangoli Powder,Split Ring, DC voltage
4	PETG,Stencil,Laptop,DC Motor,Arduino Uno,Conveyor Belt, Cereal flour,Split Ring, USB

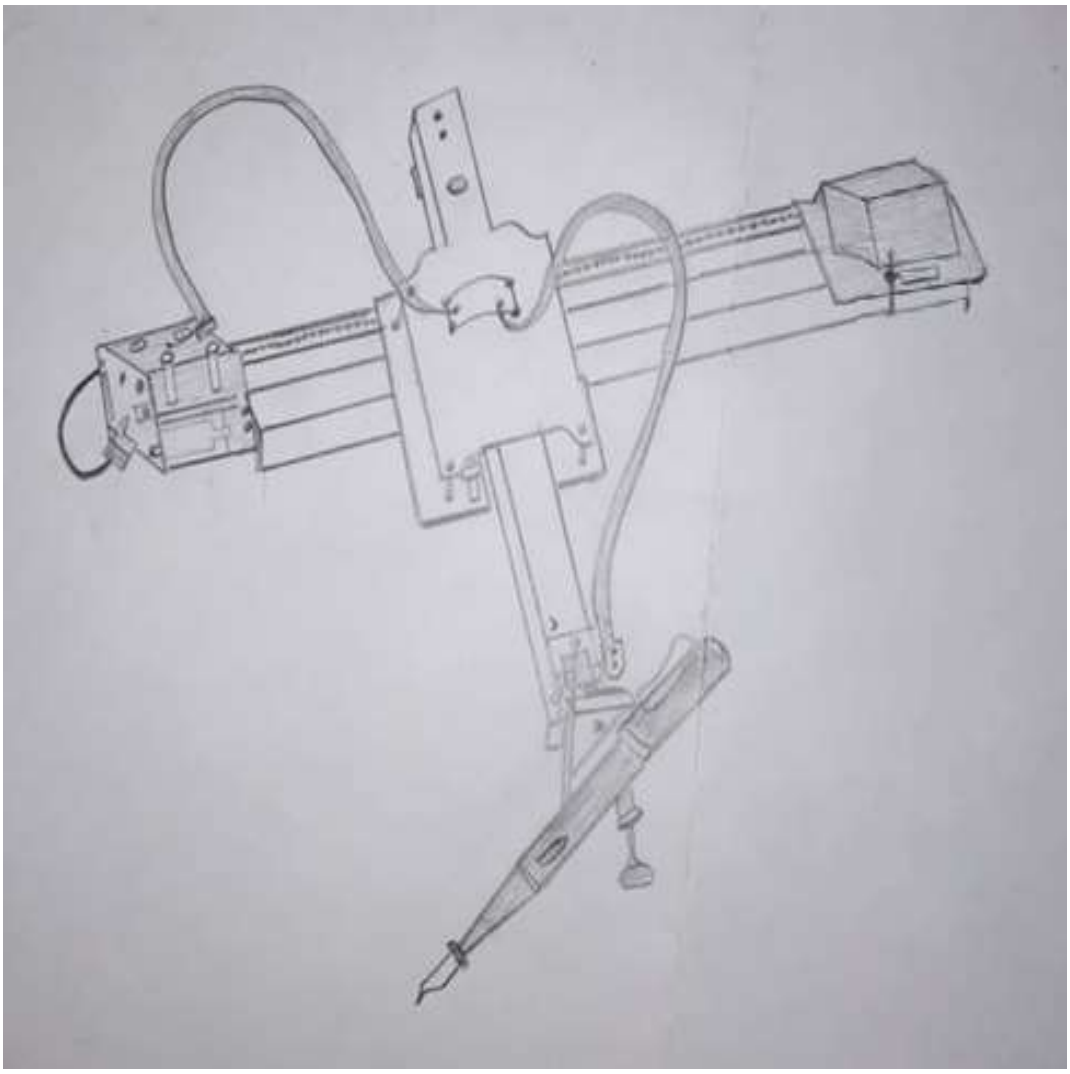
Design Alternative-01



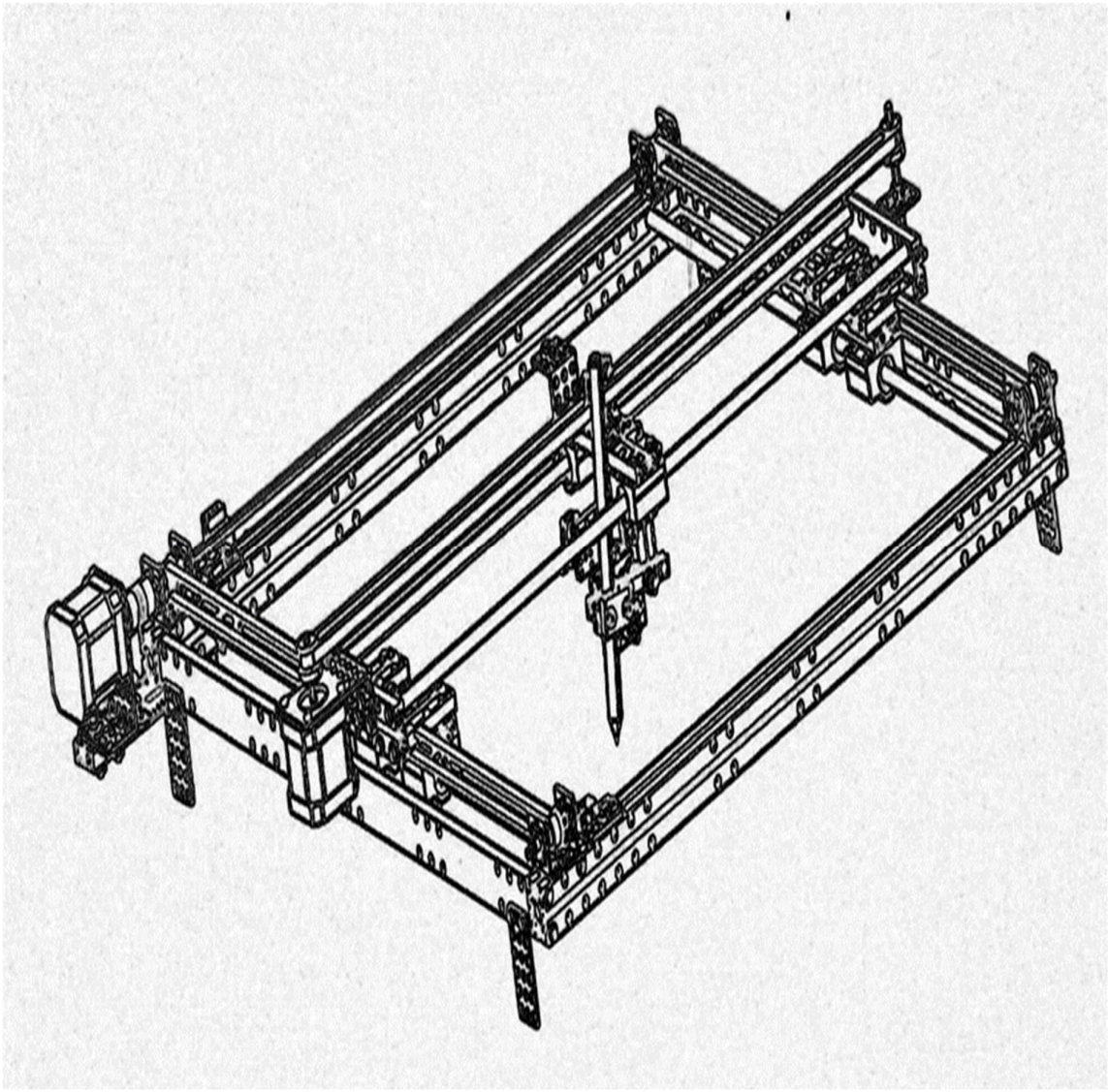
Design Alternative -02



Design Alternative -03



Design Alternative-04



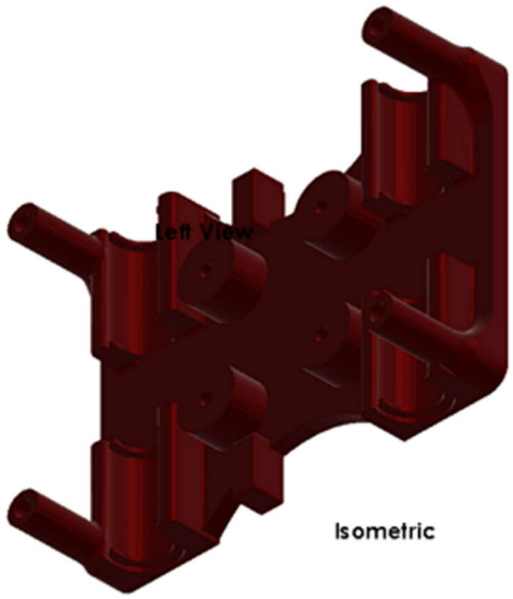
4.4 Selecting Design Alternative(Using Phugh Chart)

Requirements	Weight	Design 01	Design 02	Design 03	Design 04
Weight	5	+	+	-	+
Motor Count	5	+	+	-	+
Manufacturing	5	+	+	-	+
Cost	5	+	+	-	+
Safety	5	+	+	-	+
Mechanism	5	+	+	+	+
Performance	5	+	-	+	-
Pluses		07	06	02	06
Minus		00	01	05	01
Same		-	-	-	-
Total		07	05	-03	05
YES/NO		YES	NO	NO	NO

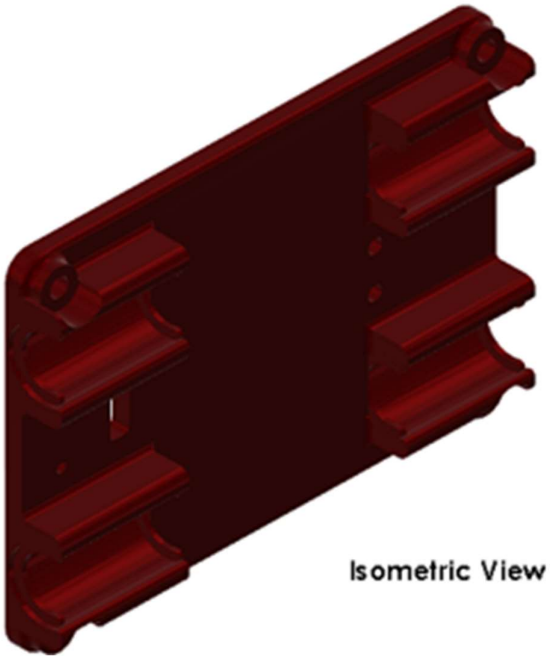
Phase 5

5.1 Model

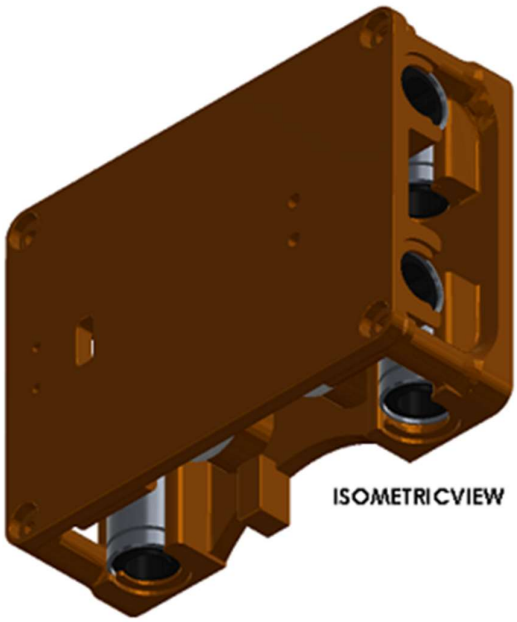
Model No. 1 (Carriage Bottom)



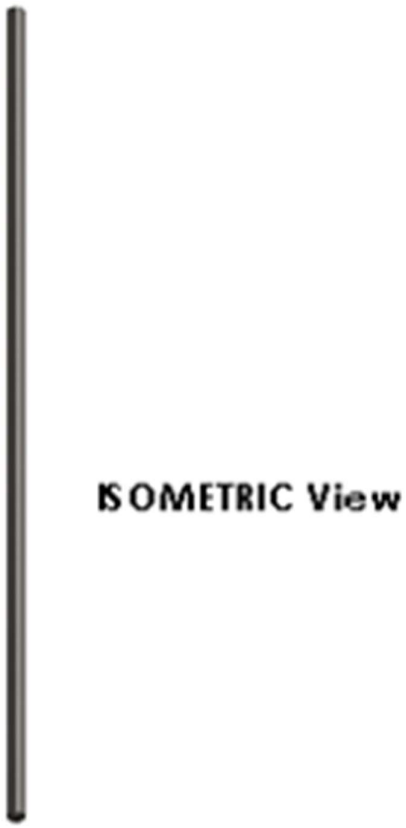
Model No. 2 (Carriage Top)



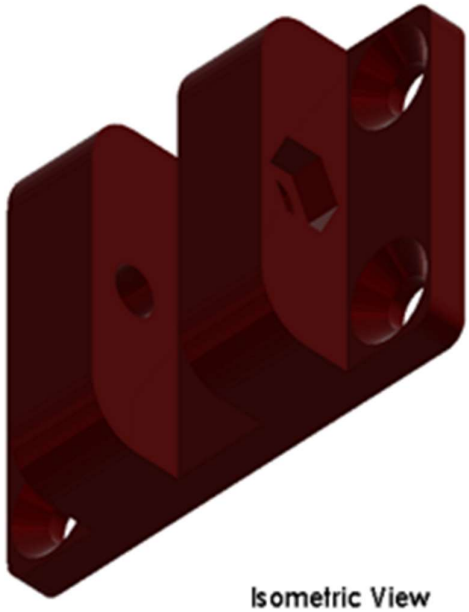
Model No. 3 (Carriage)



Model No. 4 (Bar)

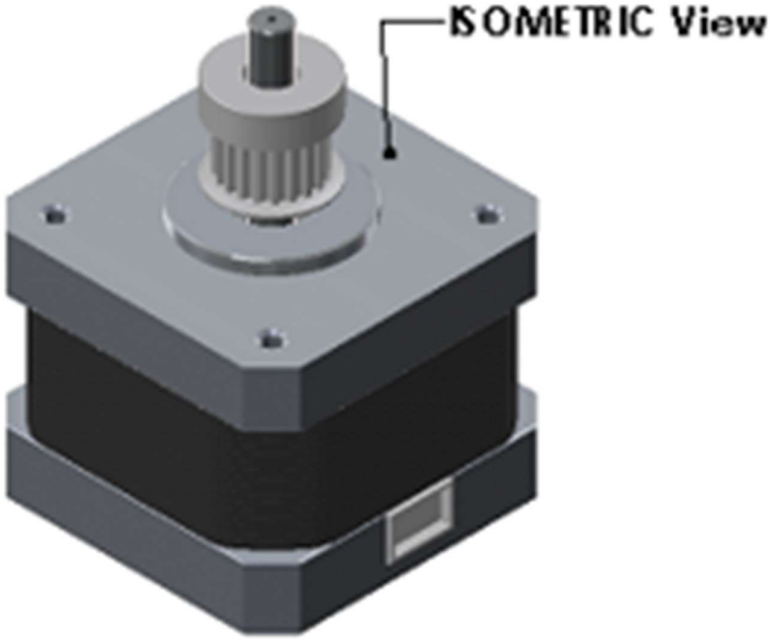


Model No. 5 (WallHolder)

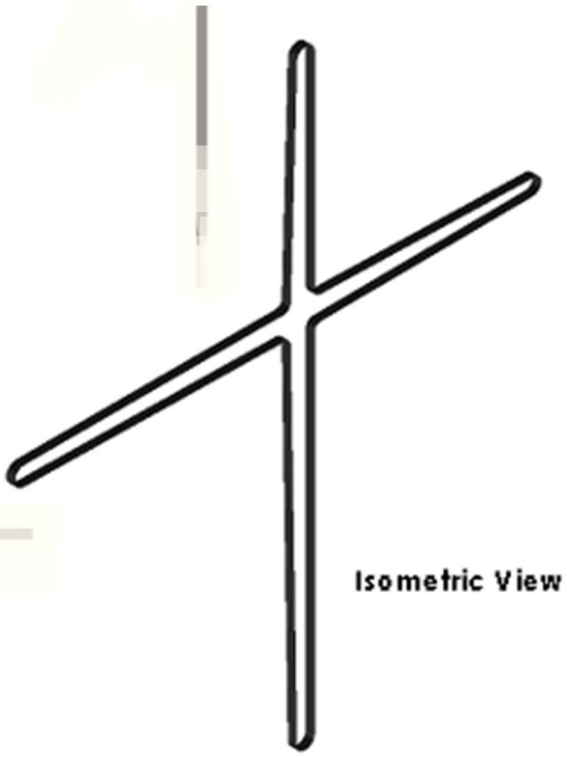


Isometric View

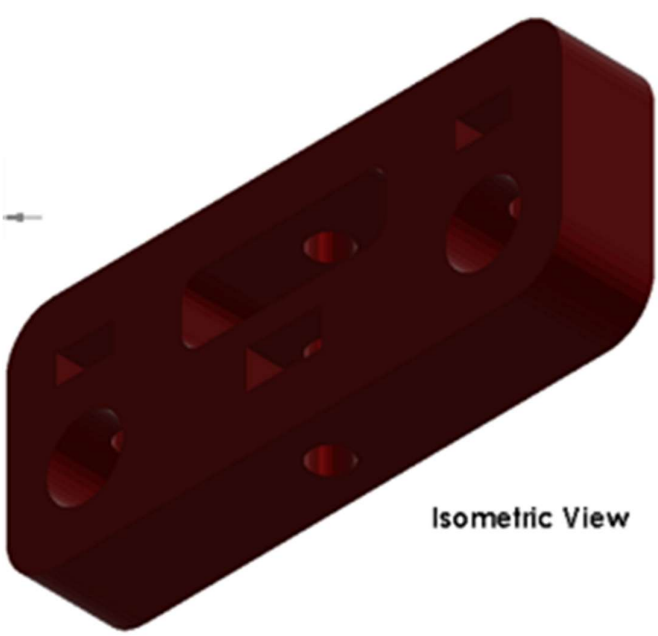
Model No. 6 (Stepper Motor)



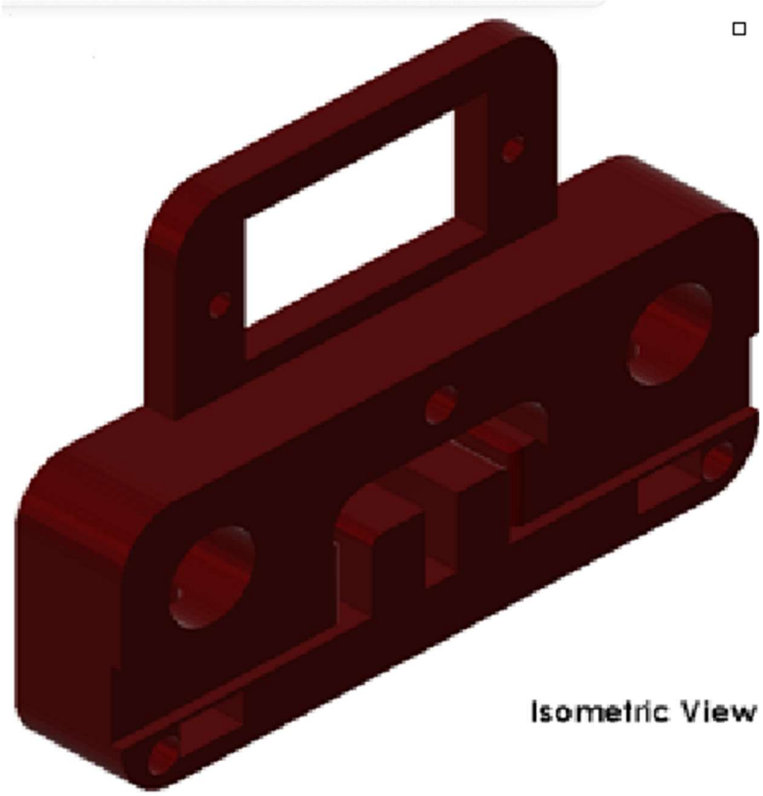
Model No. 7 (Conveyor Belt)



Model No. 8 (Y Back)



Model No. 9 (Y Front)

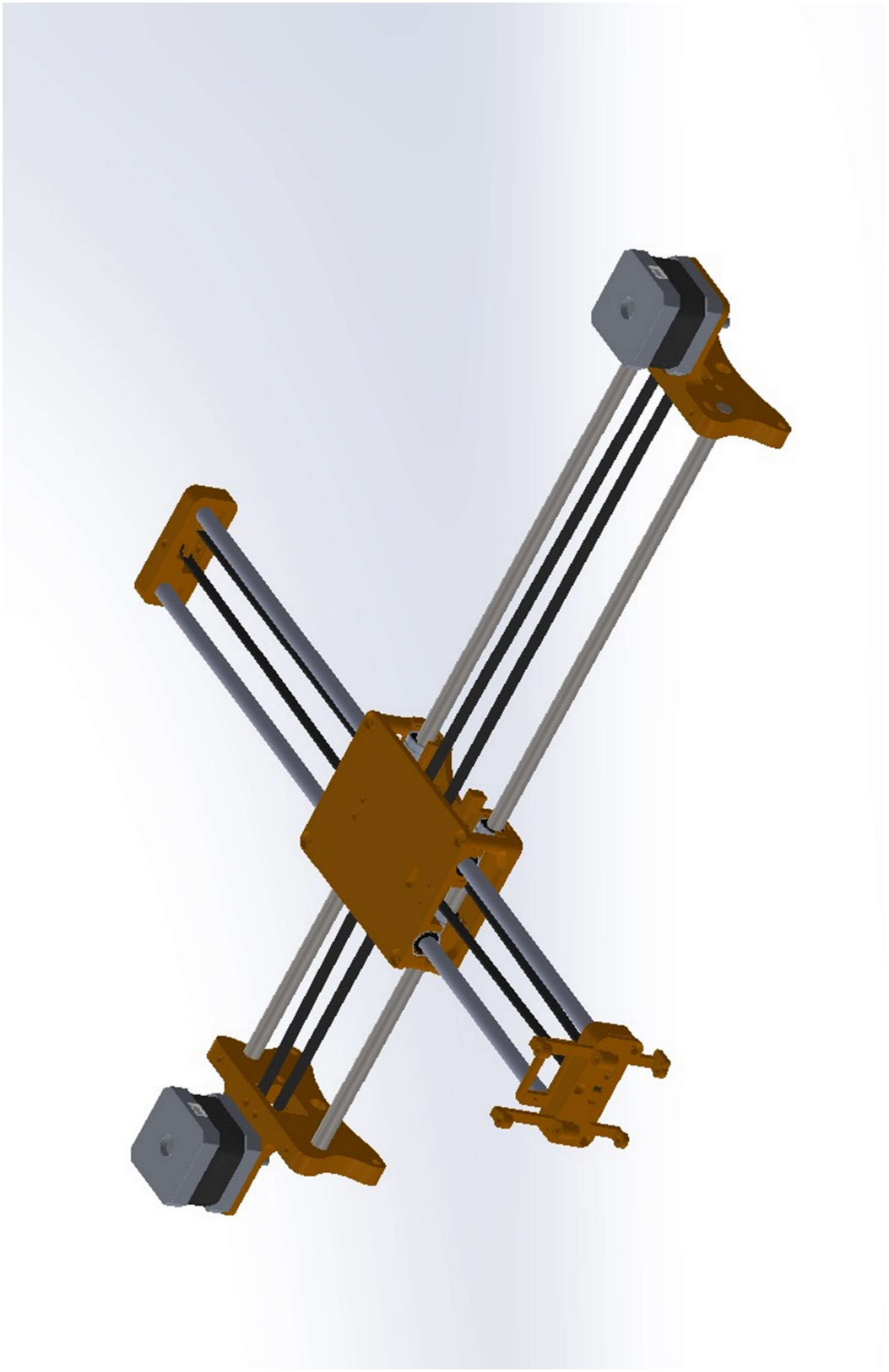


Model No.10 (X Support)

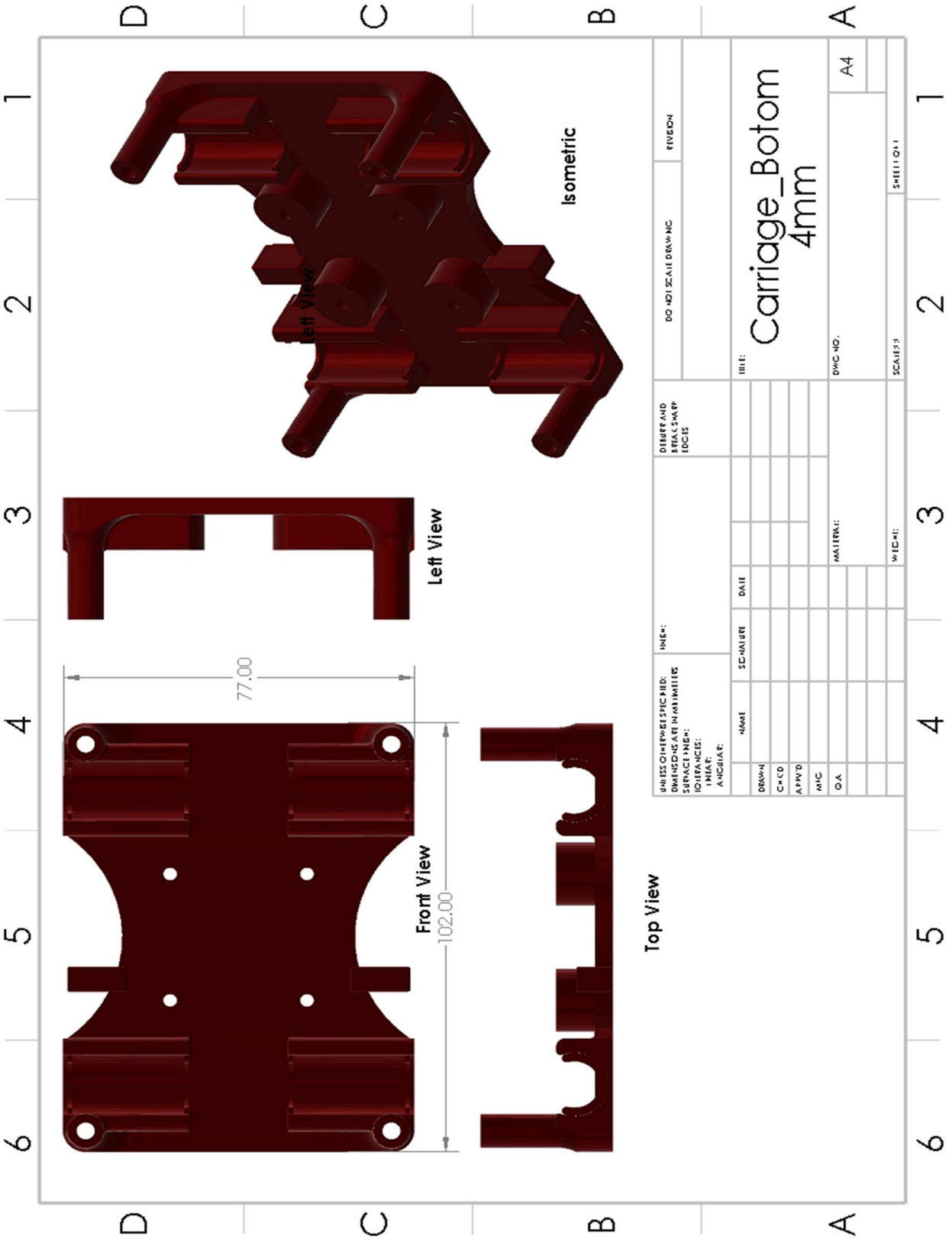
Model No. 11 (Holder)

IsometricView

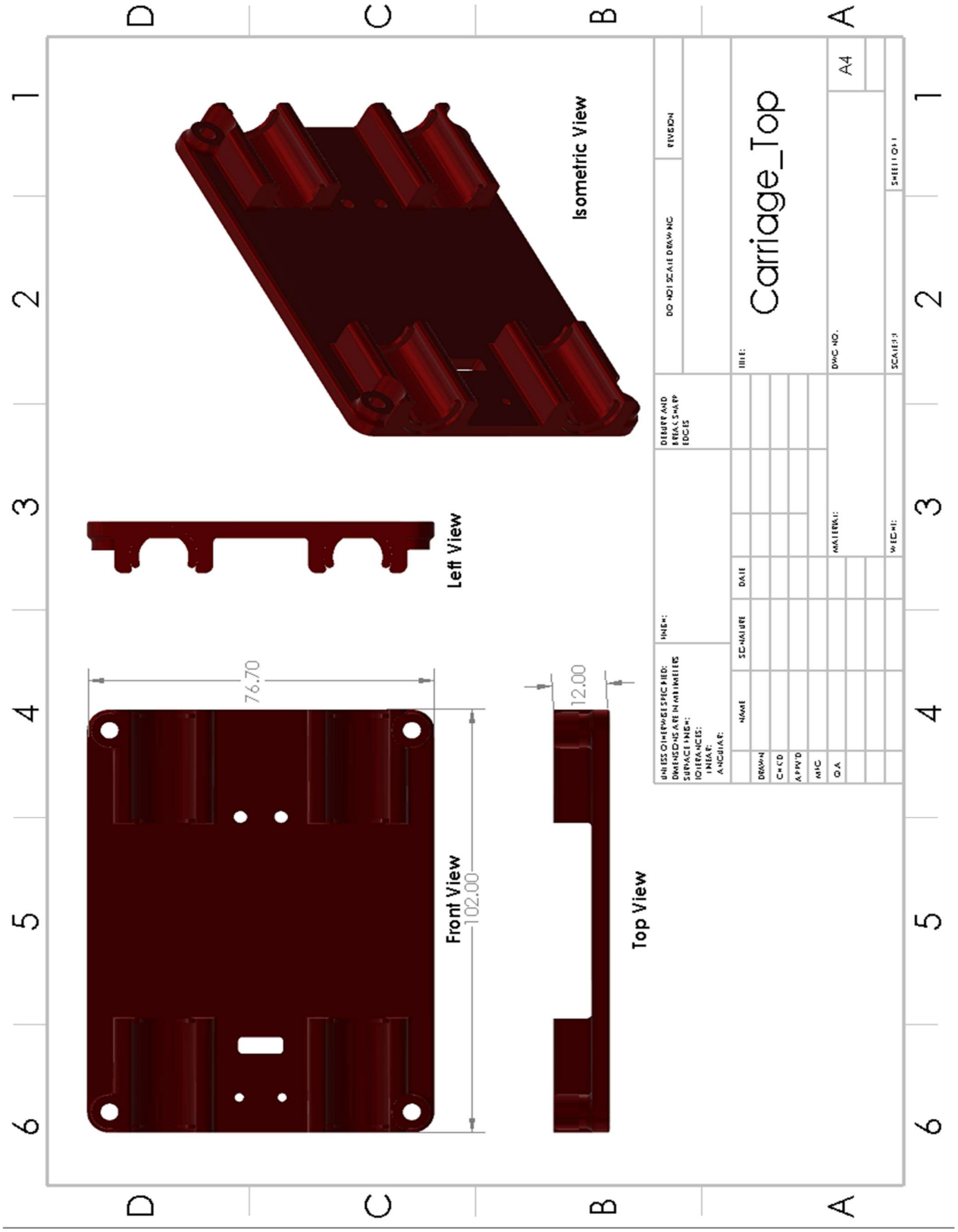
3D Final Assembly



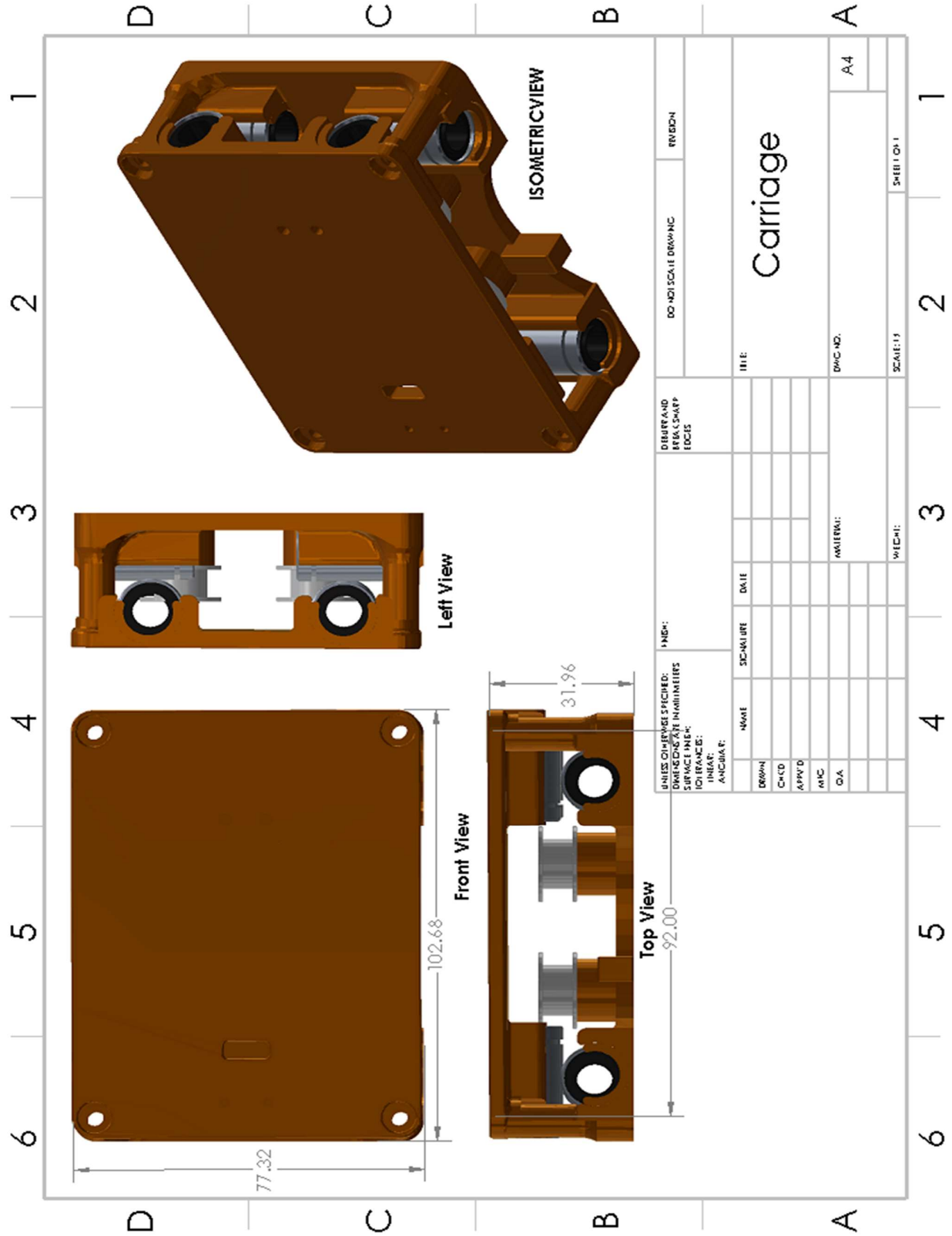
2D Drawing (Carriage Bottom)



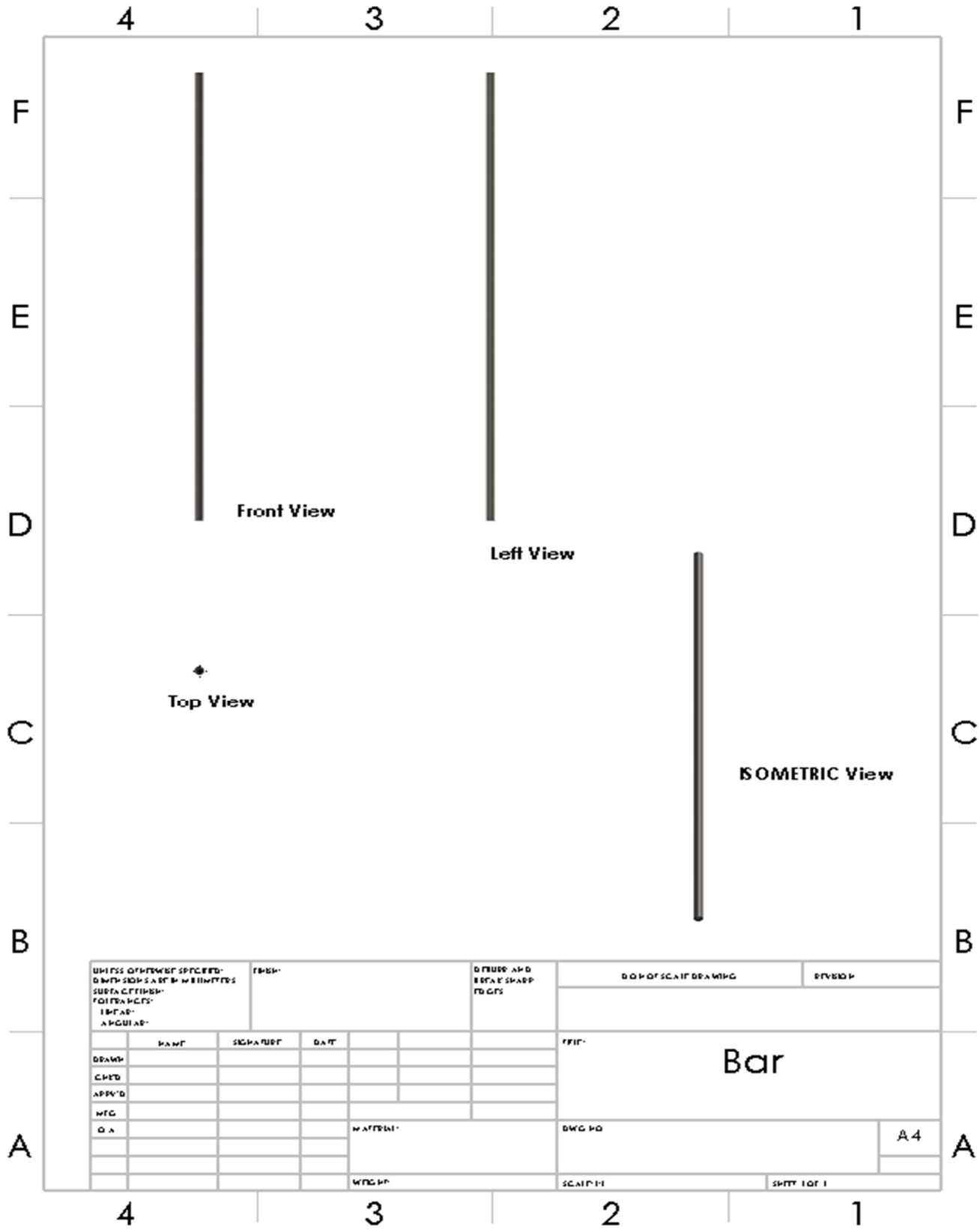
2D Drawing (Carriage Top)



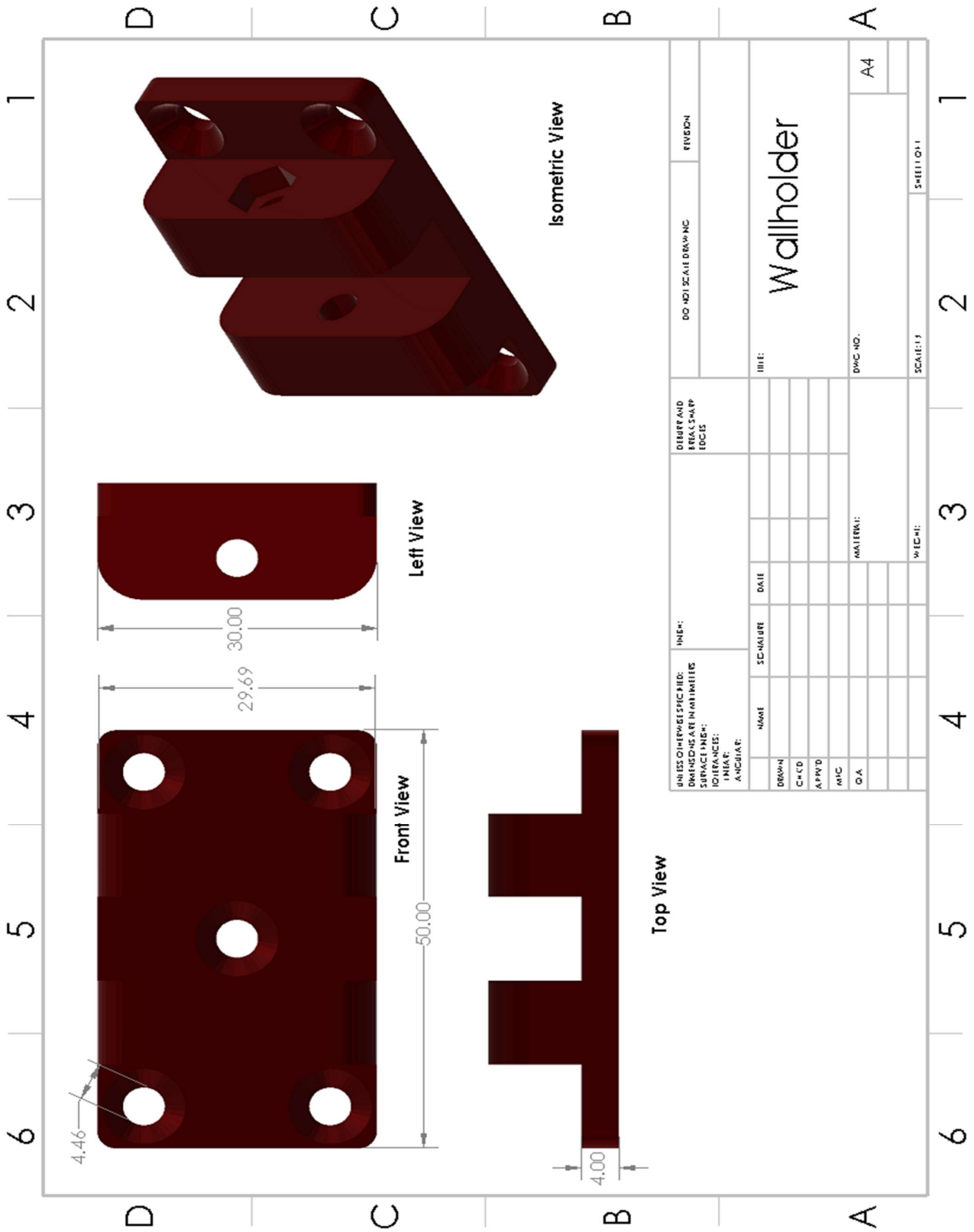
2D Drawing (Carriage)



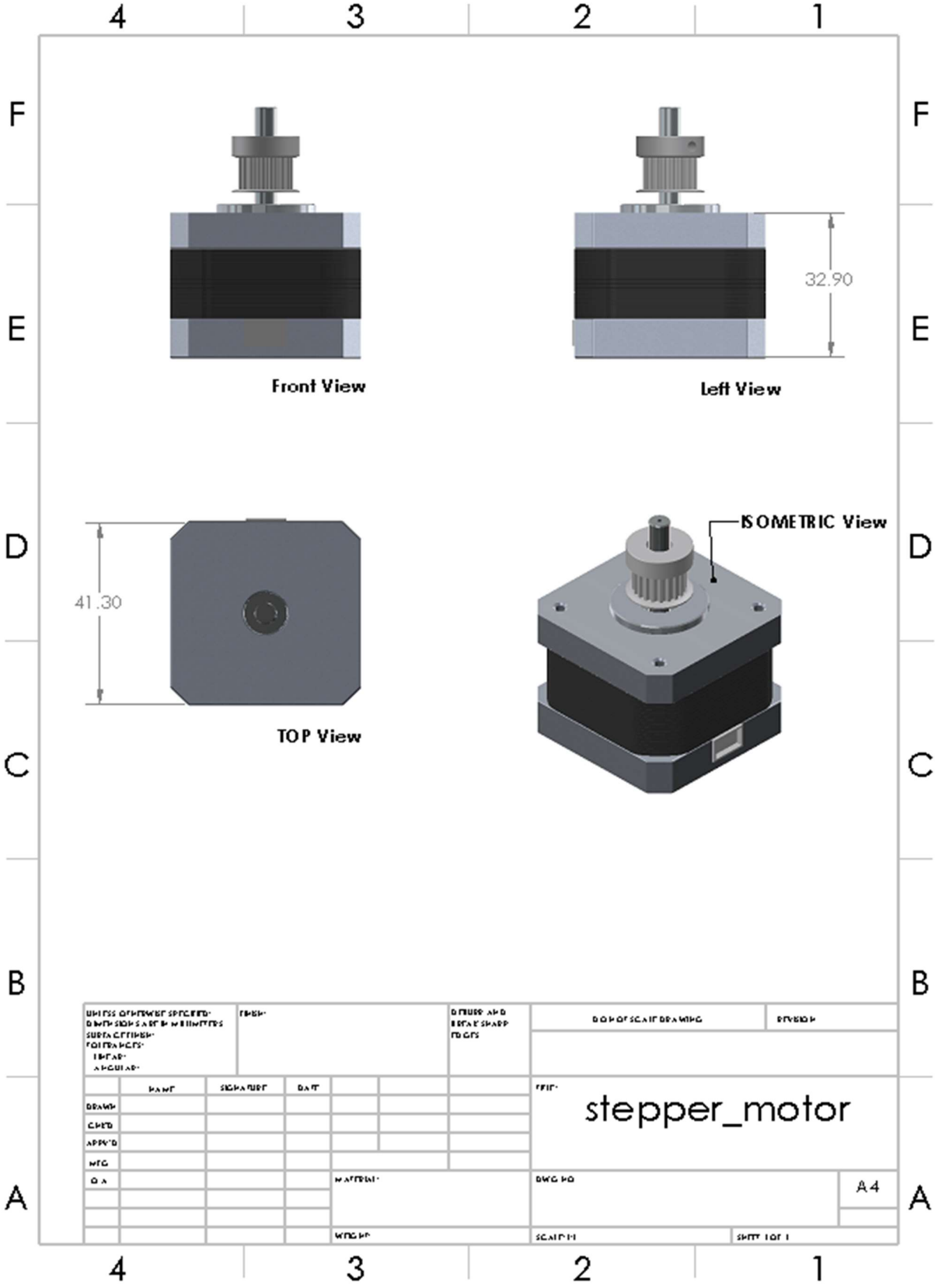
2D Drawing (Bar)



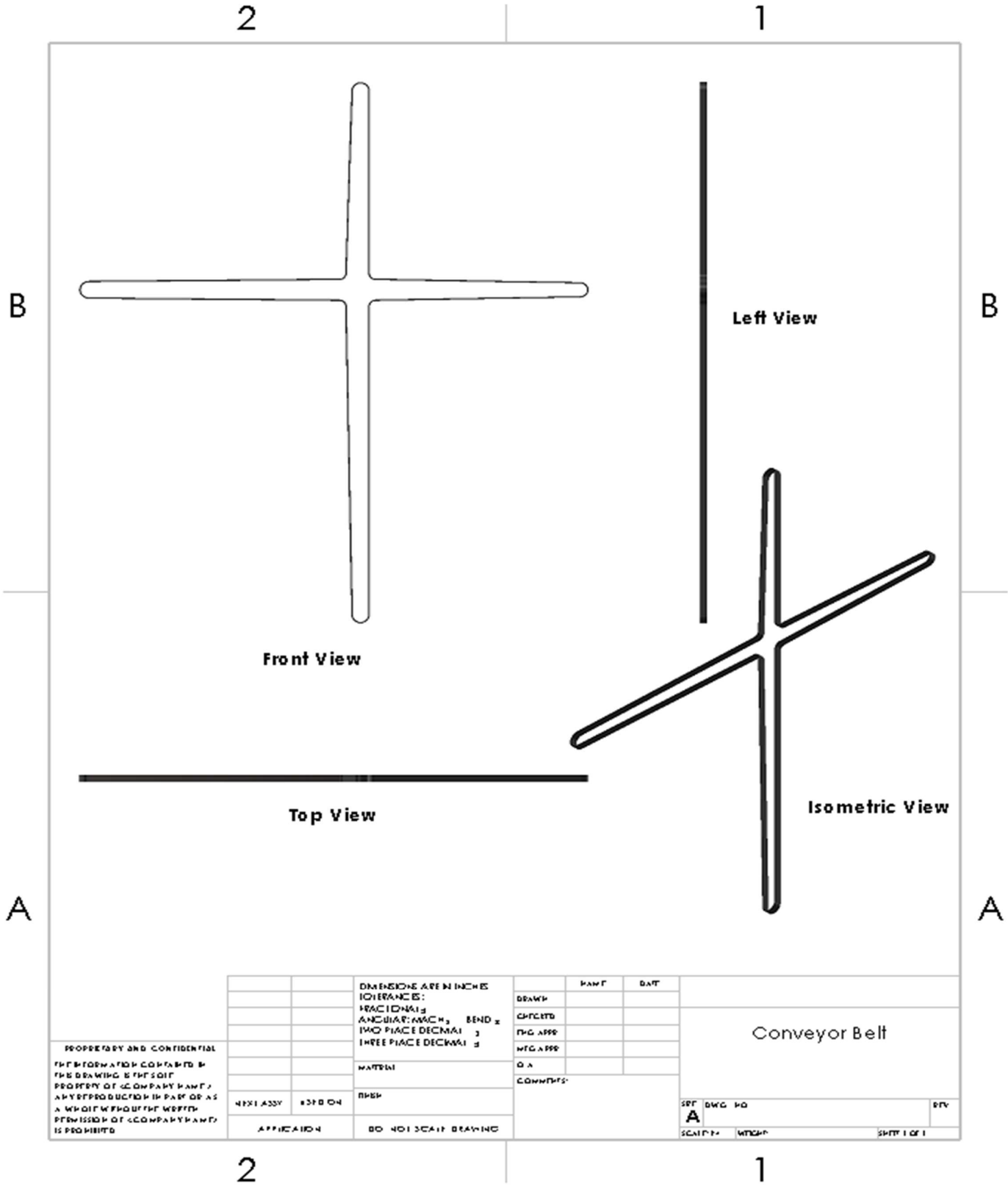
2D Drawing (Wall Holder)



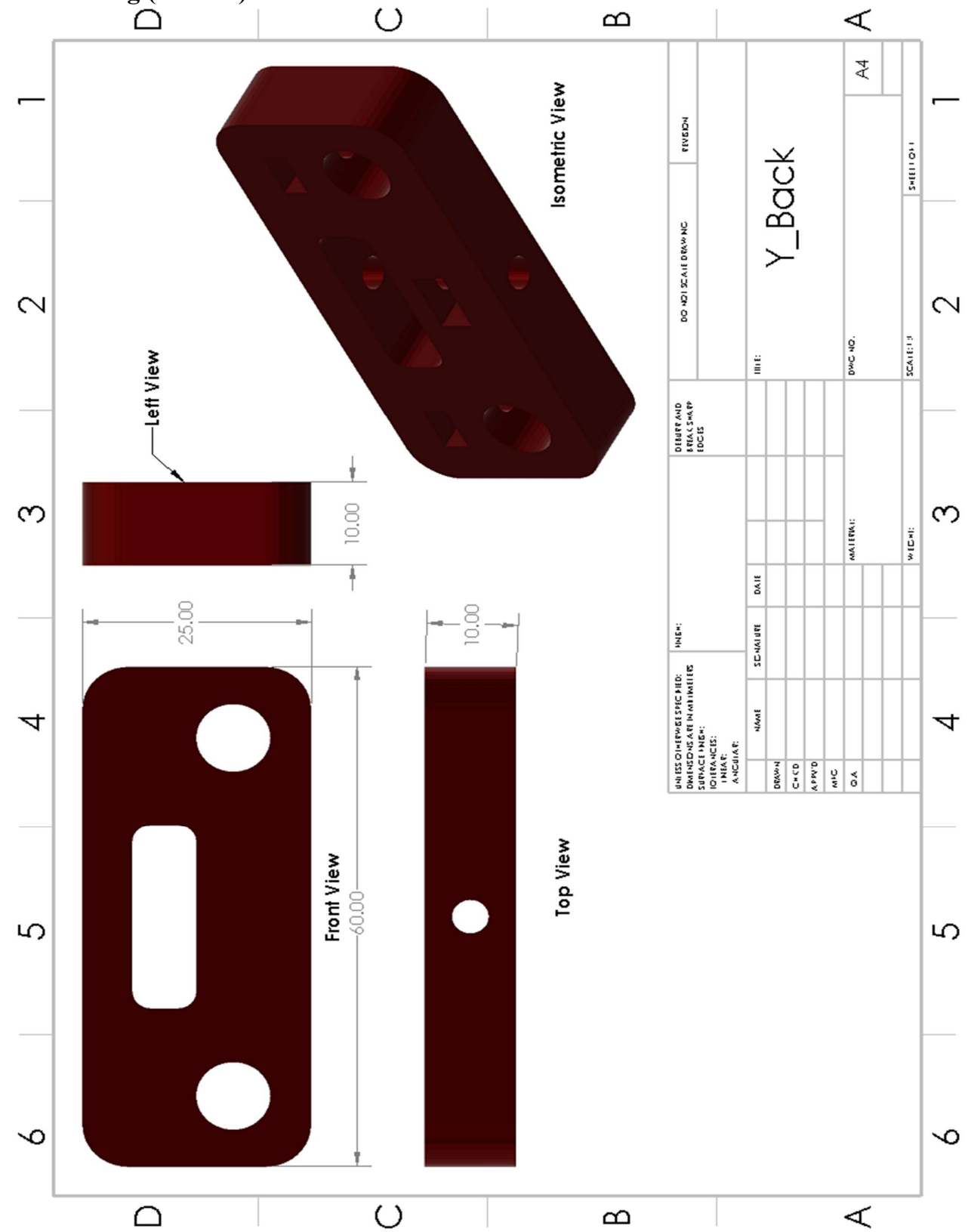
2D Drawing (Stepper Motor)



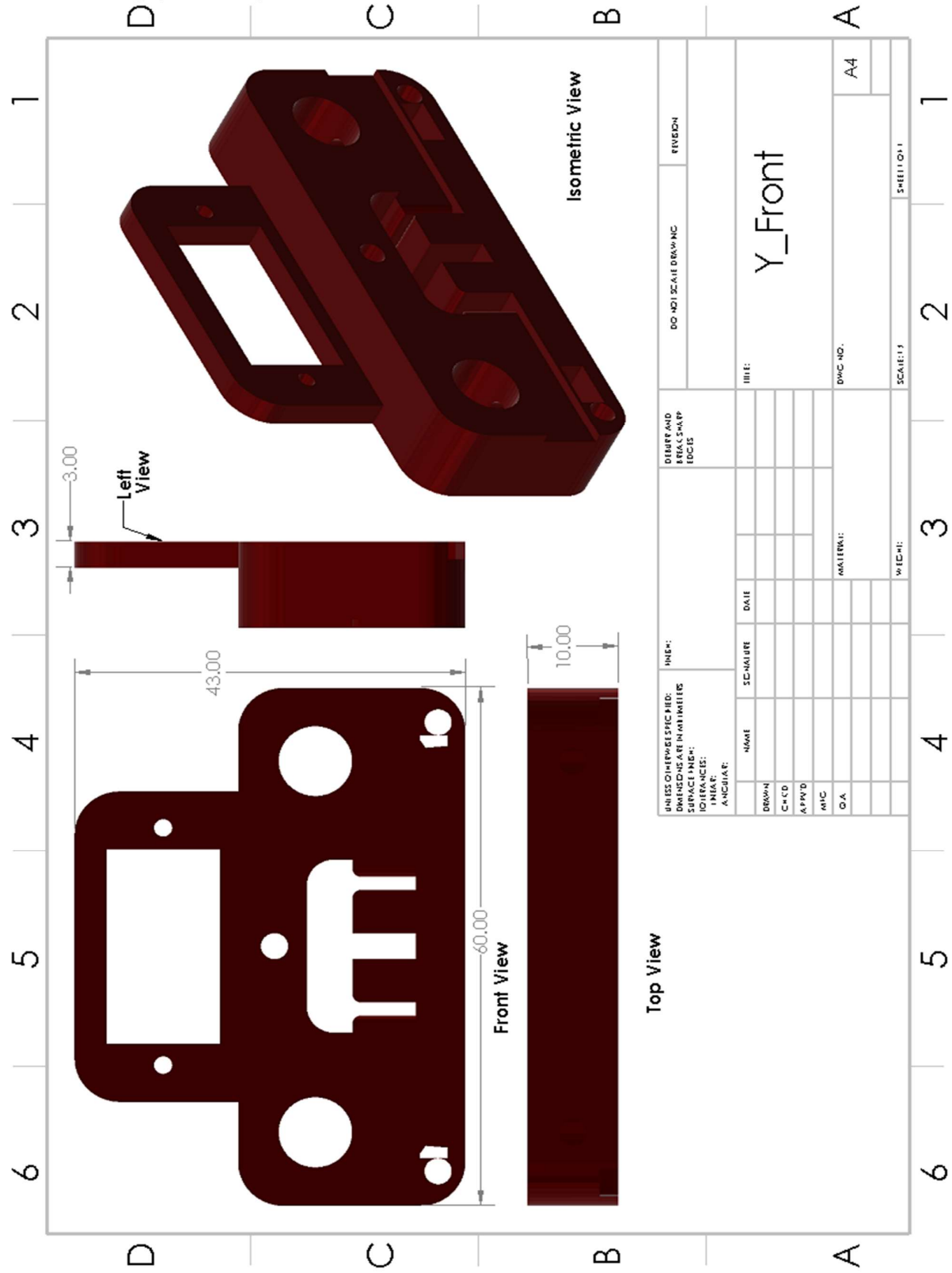
2D Drawing (Conveyor Belt)



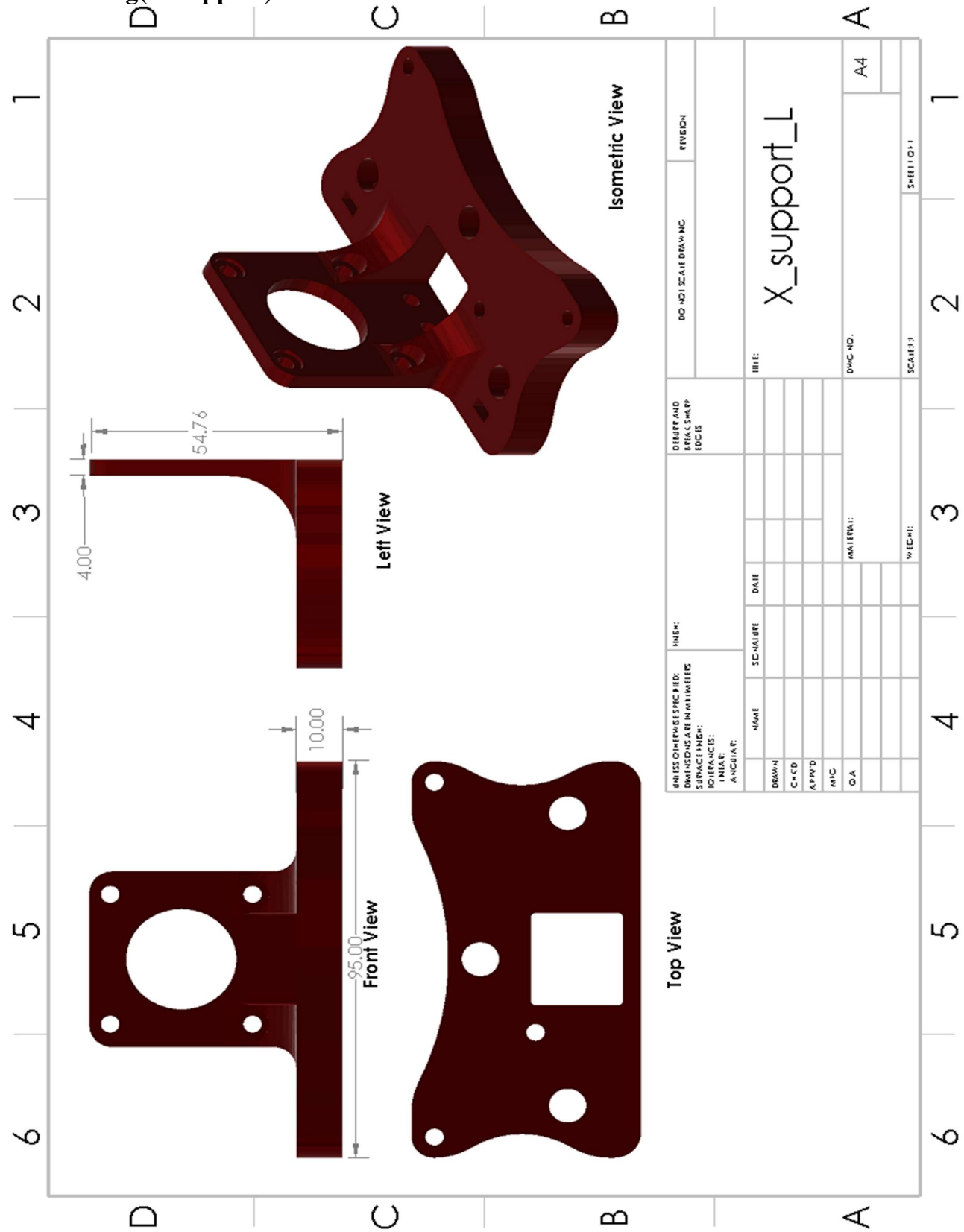
2D Drawing (X Back)



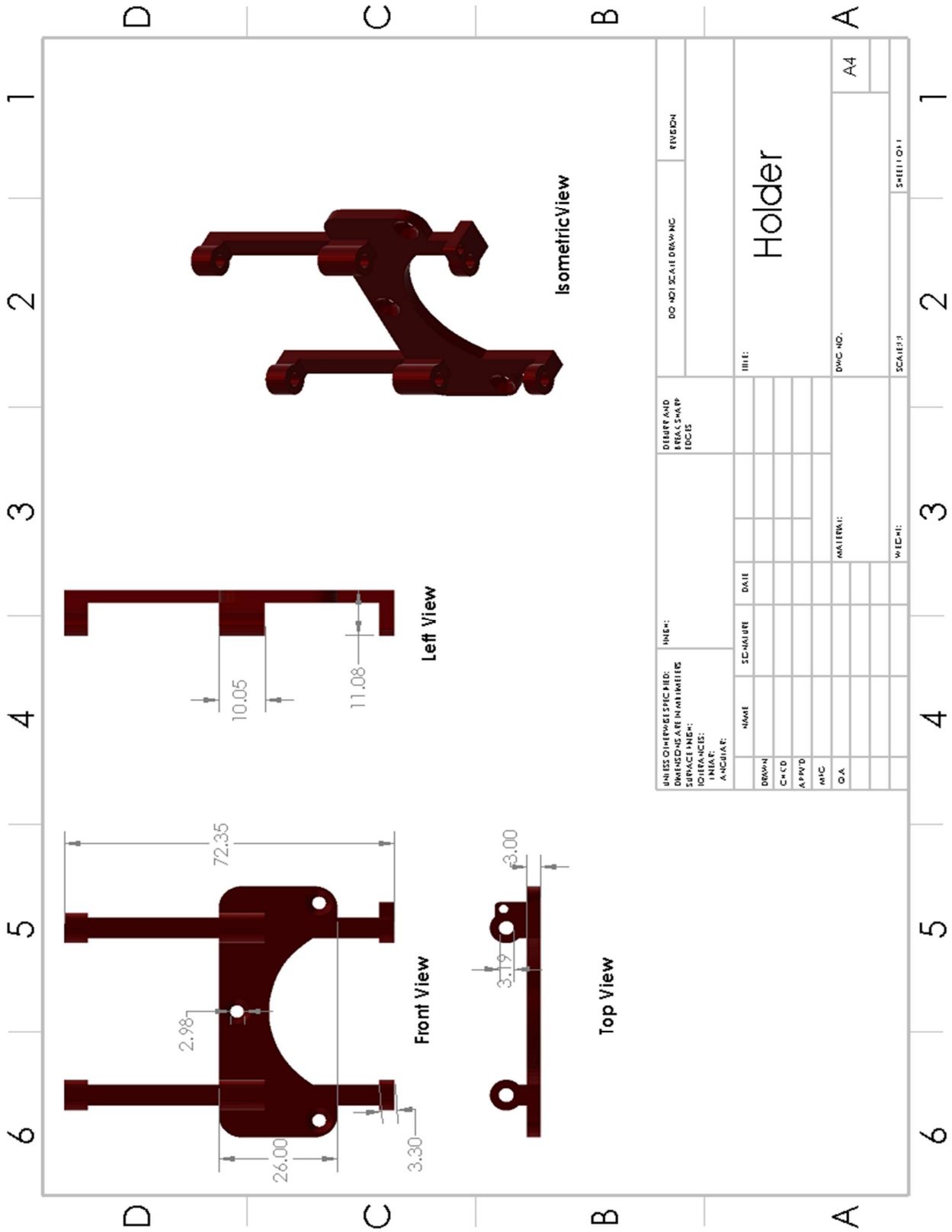
2D Drawing (X Front)



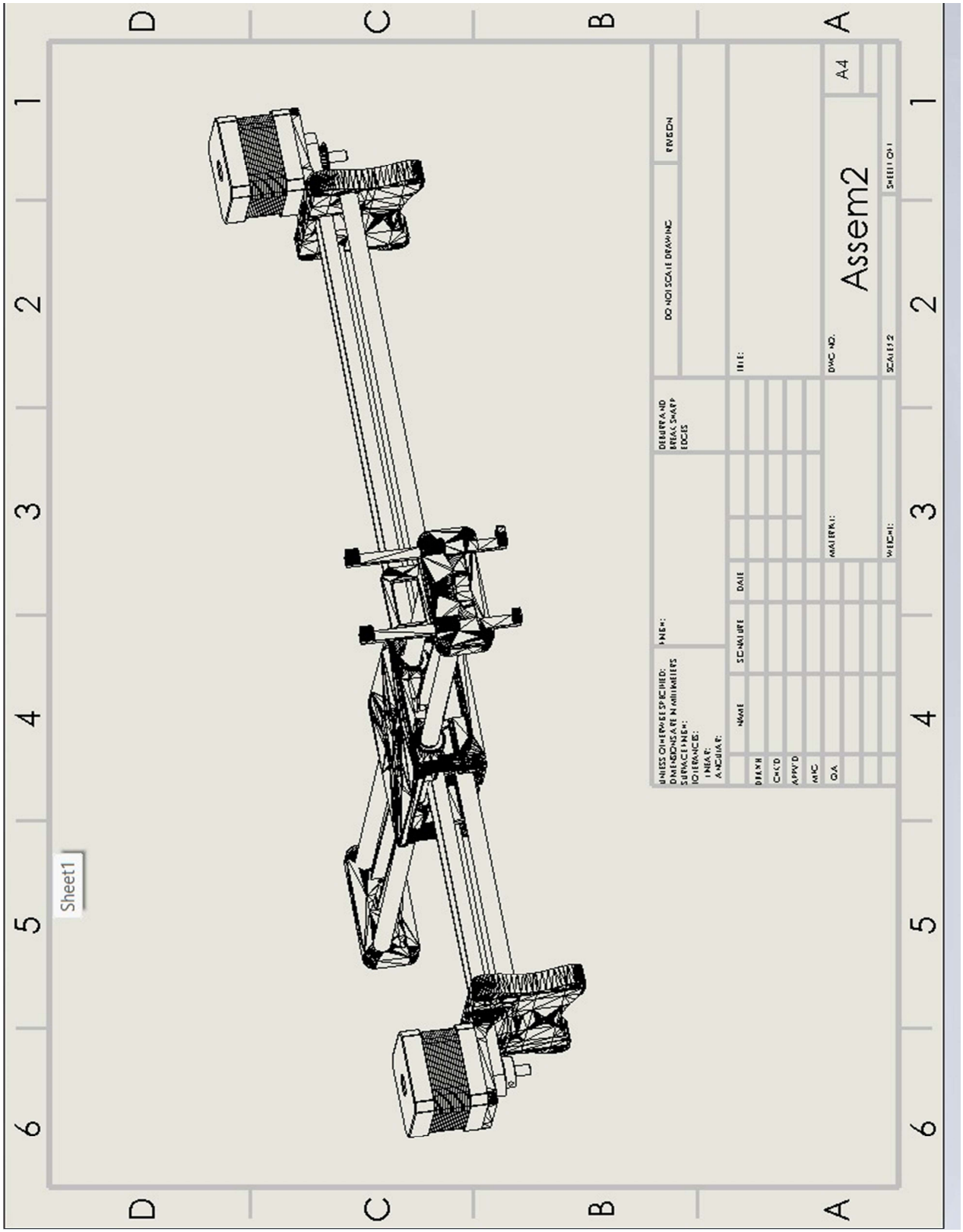
2D Drawing(X Support)



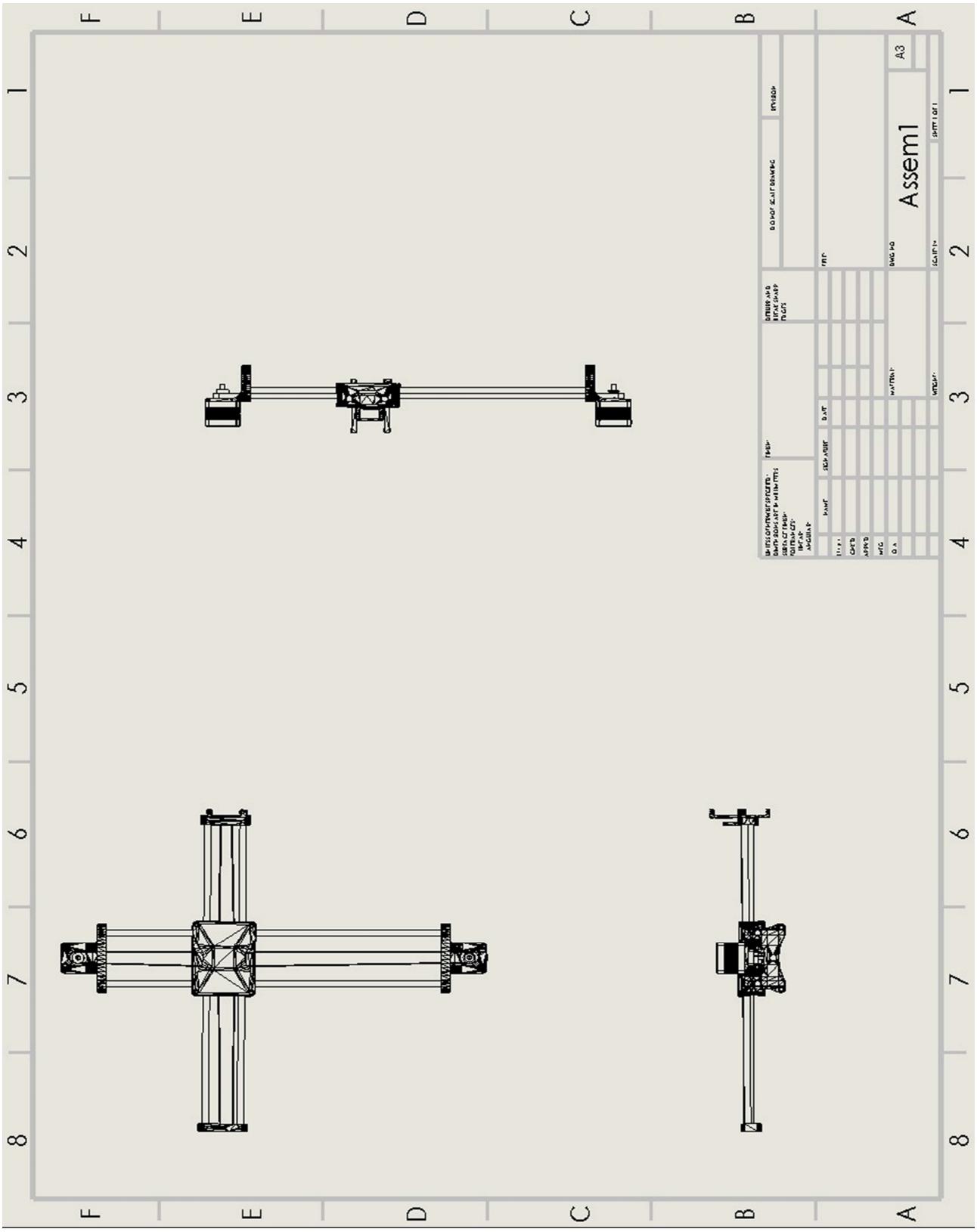
2D Drawing (Holder)



3D Drawing



2D Drawing of Final Assembly



Design Calculations

Nema 17 stepper motor

Power supply: 1.2V

Pulley: 16 teeth

Load: 3D part carriage + stencil holder + powder = 1420g

Stepper motor speed: 50 RPM

Assumptions:

We'll assume a standard GT2 timing belt with 2mm pitch

Friction coefficient: 0.1 (an estimate for rolling friction)

Calculations:

a) Pulley circumference: Circumference = Teeth × Pitch = 16 × 2mm = 32mm = 0.032m

b) Linear speed of carriage: Speed = RPM × Circumference Speed = 50 × 0.032 = 1.6 m/min = 0.0267 m/s

c) Force required to move the load:

$F = \mu \times m \times g$ where μ is friction coefficient, m is mass, g is gravity (9.81 m/s^2)
$F = 0.1 \times 1.42 \times 9.81 = 1.39$ N

d) Torque calculation: Torque = Force × Radius Radius of pulley = Circumference / $(2 \times \pi)$ = 0.032 / $(2 \times \pi)$ = 0.0051m Torque = 1.39 × 0.0051 = 0.0071 Nm

Therefore, the approximate torque required by the X-axis is 0.0071 Nm or 7.1 Nm.

Note: This is a basic calculation that doesn't account for acceleration, belt tension, or other factors that might increase the required torque. In practice, you'd want to use a motor with a higher torque rating to ensure smooth operation and account for these additional factors.

Phase 6

6.2 Raw Materials

Sl No	Material	Properties/ Reason for selecting the material	Part Name
1	3D Printed Parts	• Light Weight • High Strength	• Parts Machine Assembly
2	PVC or Fabric	• Smooth Flow • Fine Adjustment	• Conveyor Belt
3	Electronics Components	• Controlling • Driving Mechanisms	• Arduino • CNC shield • Driver A498 • Connectors • Stepper Motors • Servo Motors • Fan • Heat Sink
4	Powder	• For Drawing Pattern	• Rangoli Powder • Rice Flour
5	Steel Bar	• Hollow Circular Bar • Light Weight	• Hollow Bar
6	Powder Holder	• Low Cost • Easy to Use	• Stencil

6.3 Bill Of Materials

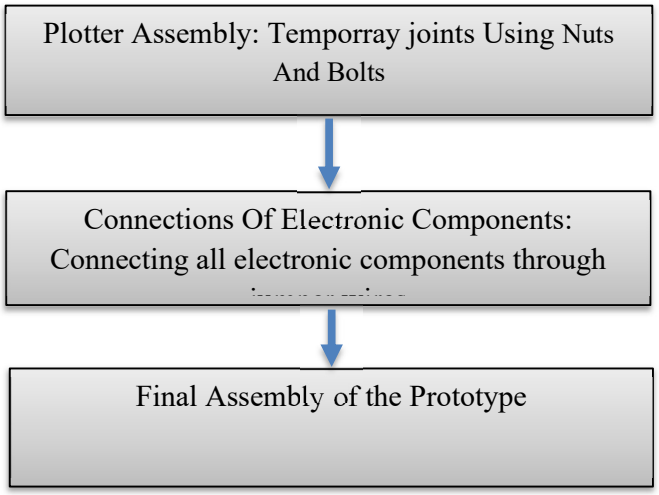
Sl.No	Part name	Quantity
1	3D Parts	08
2	Arduino Uno	01
3	CNC Shield	01
4	Stepper Motor Driver	02
5	A498 Driver	02
6	Fan	01
7	Servo Motor	01
8	Jumping Wires	06
9	Nut And Bolt	15
10	Conveyor Belt	01
11	Arduino Connector	01
12	Bar	02
13	12 V Power Supply	01
14	Stencil	01
15	Vibrator	01
16	Bearing	04
17	Nut And Bolts	15
18	Guideways	04

6.4 Joing Techniques/ Method

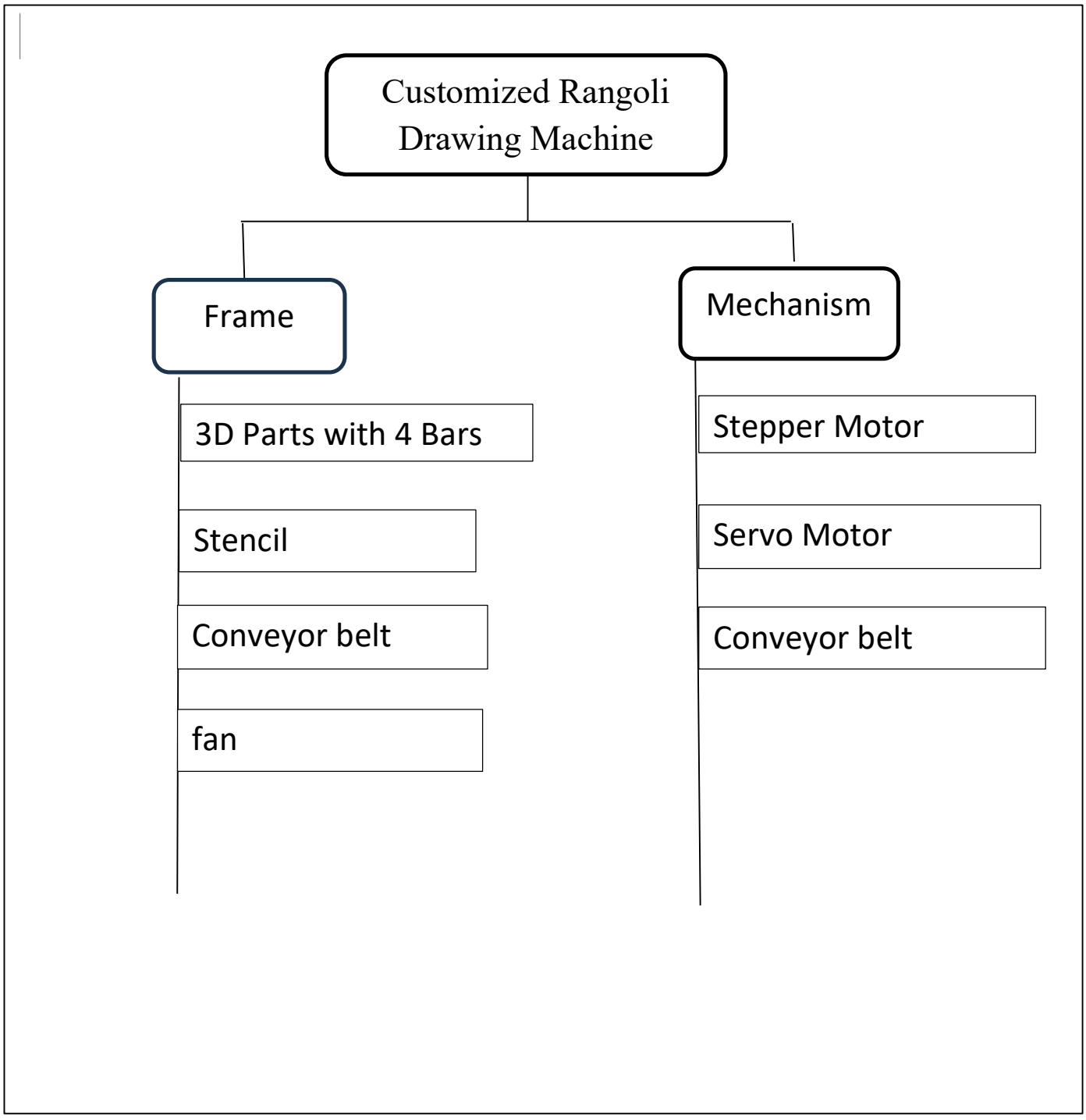
Sl.No	Joining Method	Material to be Joined
1	Bolts And Nuts	Stepper Motors,3D Parts,
2	Jumper Wires	Arduino, CNC Sheild, Stepper Motor, Servo Motor, Fan

6.4 Flow Chart

Prepare Tentative flow chart for series of operationto be followed for prototyping



6.6 Sub Assembly Planning



Sub Assembly	Brought Out Parts	Manufactured Parts
SA 1	Rangoli Powder	3D Parts for Frame
	Stepper Motor	
	Servo Motor	
	A4988 Driver	
	Fan	
	Conveyor Belt	
	Power Supply	
	Connecting Wire	
	Stencil	

Phase 7:

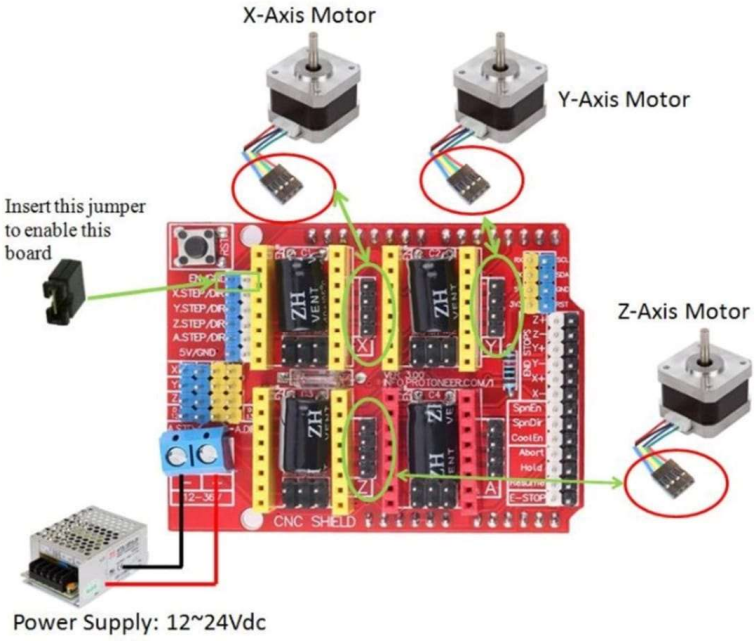
7.1 Final Cost Estimation

Product Expenses

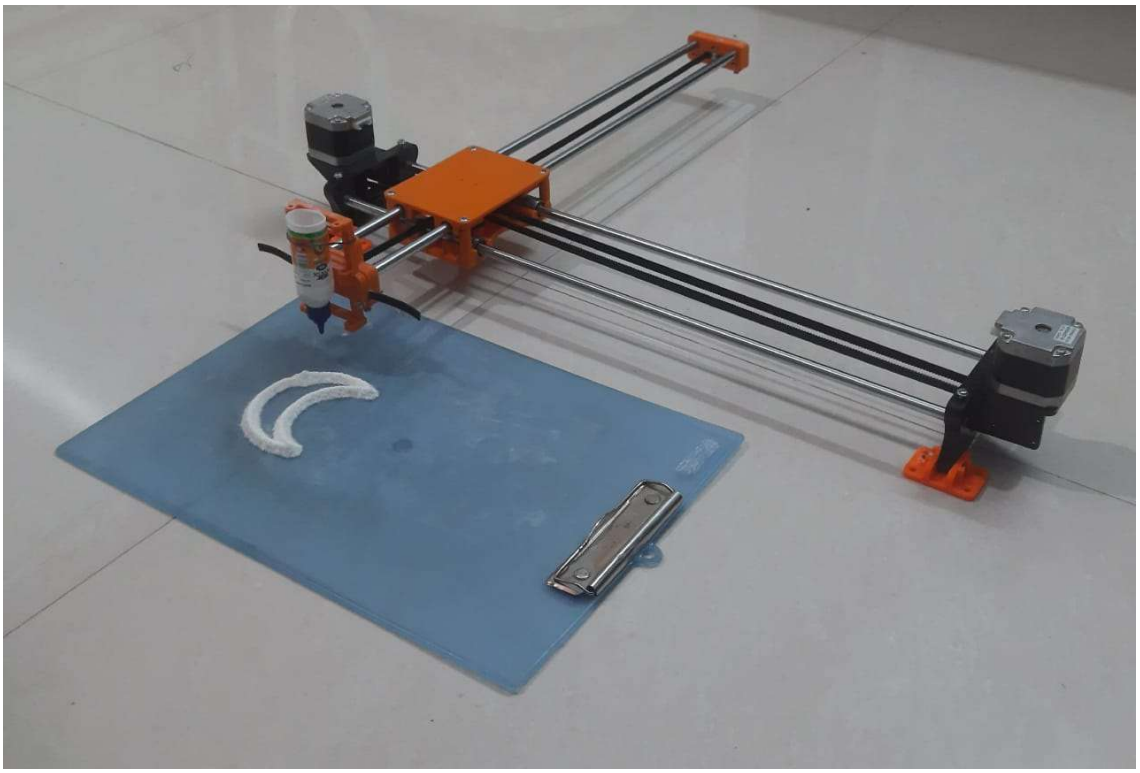
SL	Part Name	
1.	3D parts and 4 rod	
2.	Conveyor belt	
3.	Stepper motor	
4.	Servo motor	
4.	A4988 driver	
5.	Adaptor	
6.	Stencil	
7.	Fan	
8.	Rangoli powder	
9.	Other expenses	
10.	Vibrator	
	Total parts expenses Rs.	**7,000**

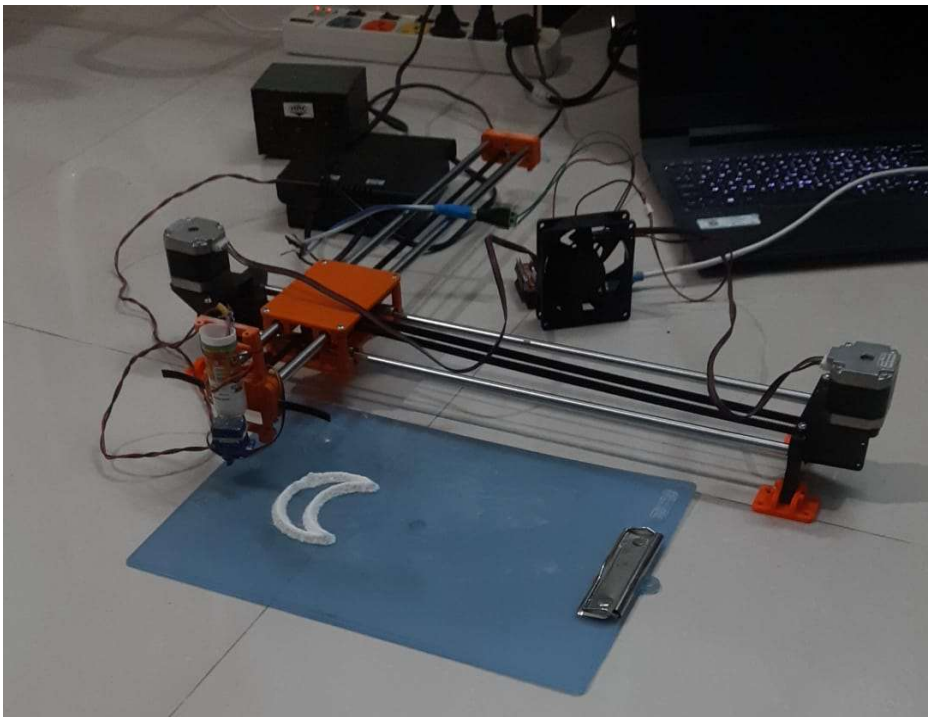
7.2 Final Prototype Pictures

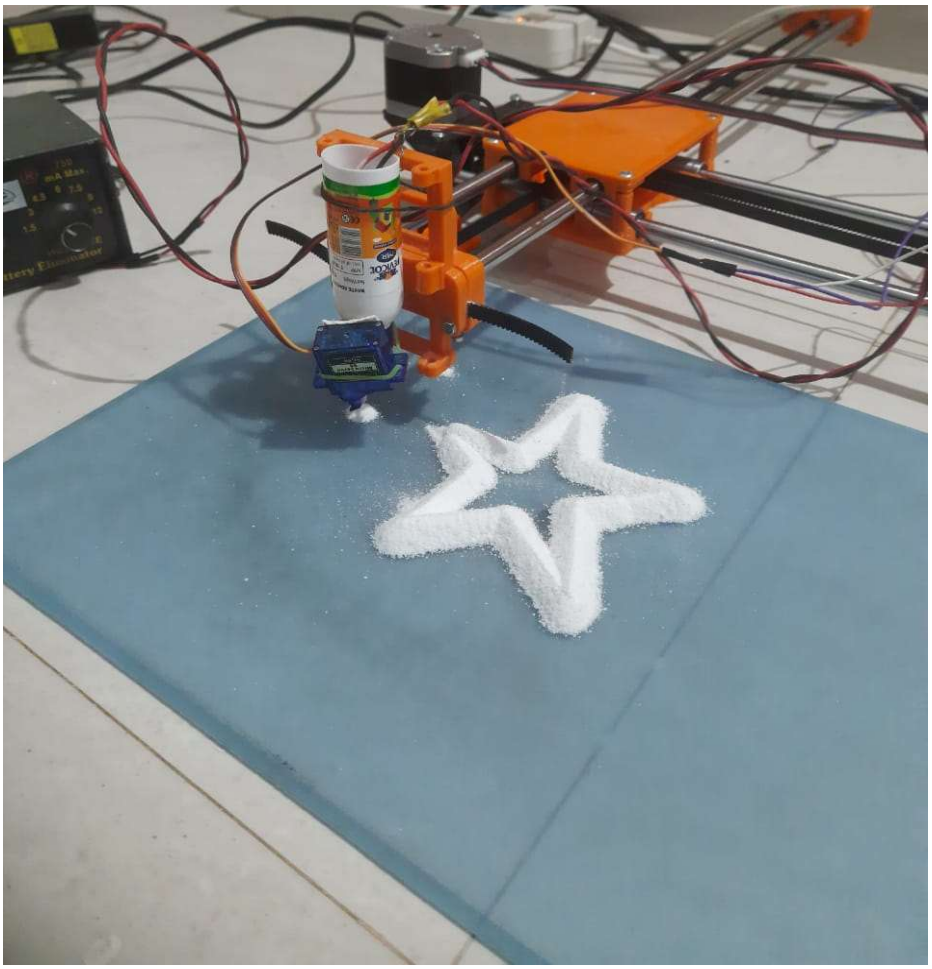
Electrical Connections



Actual Working Model







7.3 Conclusion

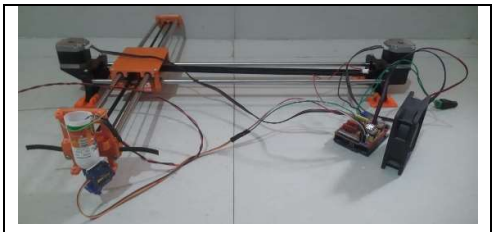
In conclusion, the project aimed to develop and draw customized rangoli designs and patterns specifically tailored for the Ladies and Event Managing Department. Throughout the prototyping phase, we encountered significant difficulties and errors. Initially, the use of a 2 ampere adapter and 5V supply led to malfunctioning of the plotting mechanism, prompting us to replace all components in search of a solution. It became evident that the root cause lay in the inadequacy of the power supply.

By troubleshooting and upgrading to a new 12V supply and 5 ampere adapter, we successfully resolved these issues. This adjustment allowed us to achieve precise drawing capabilities, effectively realizing our goal of creating intricate and accurate rangoli designs.

This experience underscored the importance of meticulous planning and testing in the development of technical projects. It highlighted the critical role of power supply specifications in the functionality and reliability of our Project. Moving forward, these lessons learned will guide us in future projects, emphasizing the need for robust equipment selection and systematic troubleshooting to ensure optimal performance and successful outcomes.

7.4 Product Catalogue

Product in Use



Operating Instructions

- *Ensure that the all the connections are coorect and proper*
- *Load the rangoli powder in the holder ensure the secured fit*
- *Power on the supply*
- *Verify all parameters are set correctly on the software interface.*
- *Plot the pattern in the inkscape and generate the cnc programme.*
- *Upload the generated programme in the UGS software.*
- *Set the machine to origin position.*
- *Start the mechanism by pressing the start button*

Introduction

An Customized Rangoli Drawing Machine is a versatile, computer-controlled device used for precise two-dimensional movement along the X and Y axes. It consists of a motorized mechanism that moves a drawing tool, such as a stencil or pen, over a flat surface to create intricate designs, patterns, or drawings.

Overall, the XY plotter is a foundational tool in both hobbyist and professional settings, valued for its precision, adaptability, and ease of use in translating digital designs into physical creations.

Team A4 Members


01


02


03


04


05

Name1: Mahantesh R Aralikatti
Name2: Soundarya Nagaraj Koti
Name3: Vishwanath Patil
Name4: Abhishek Koparde
Name5: Pallavi Patil

Mentors:
Prof: Gururaj Fattepur
Prof: Shreeshail

For more info Contact:
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Ph No: 7816919159
www.website.com

Features

- ✓ *Accuracy and Precision*
- ✓ *User friendly interface*
- ✓ *Accurate timing*

Advantages

- ✓ *Compact size and portable*
- ✓ *Maintaining efficiency, reliable and accuracy.*
- ✓ *Draws complex Patterns*
- ✓ *Cost Effective*
- ✓ *Light in weight*
- ✓ *Portable*
- ✓ *Less Space Required*
- ✓ *Reliability and Durability*
- ✓ *Ease to use*

Product Specifications

SL No	*Engineering Specifications*	*Units*
1	*Sizes*	*500mmX500mm*
2	*Stepper*	*Nema17, 200steps*
3	*Power supply*	*12V*
4	*User Interface*	*UGS, Inkscape*
5	*Weight*	*1450grams*
6	*Time to Operate*	*minutes*
7	*Flow rate*	*mm^3/s*

KLE Technological University
Creating Value Leveraging Knowledge

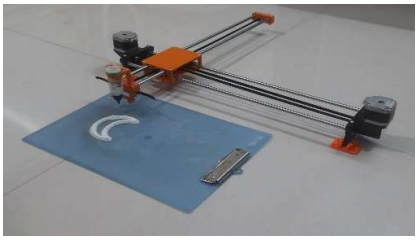
A Minor Project Report on

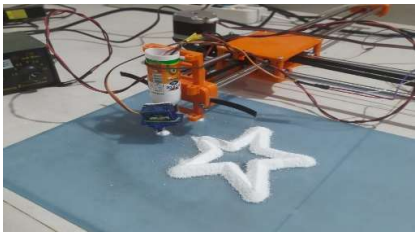
"Customized Rangoli Drawing Machine"

School Of Mechanical Engineering

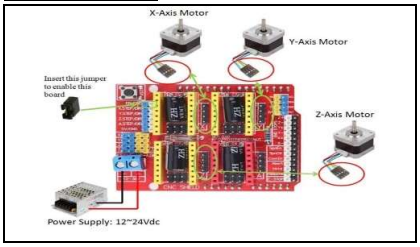
Experience Engineering @ School of Mechanical EngineeringKLETECH
Engage | Explore | Excel | Evolve

Submitted By Team A4

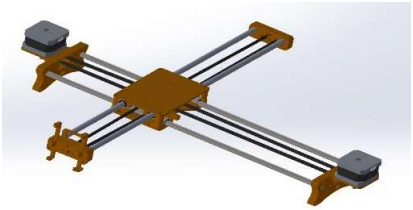




Circuit Diagram



3D Model



Gantt Chart for Minor Project 2023-24

#	Activity	March				April				May				June			
		Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
1.1	Identifying end users (Customers)	√															
1.2	Identify customer needs		√														
1.3	Analyzing the needs			√													
1.4	Requirements List			√													
2.1	Studying and exploring competitive products		√														
2.2	Patent search		√														
2.3	Literature survey			√													
3.1	Objectives				√												
3.2	Constraints				√												
3.3	Objective tree (affinity diagram)				√												
3.4	Design Specifications				√												
4.1	Defining Functions				√												
4.2	Morphological chart					√											
4.3	Generating design alternatives					√											
4.4	Selecting best alternatives (Pugh chart)					√											
5.1	3D Model						√										
5.2	Assembly models						√										
5.3	2D drawing						√										
5.4	Design Calculations							√									
6.1	Raw materials								√								
6.2	Bill of Materials									√							
6.3	Joining techniques/ methods									√							
6.4	Flow Chart										√						
6.5	Sub-Assembly Planning										√						
7.1	Fabrication										√						
7.2	Finishing Process															√	
7.3	Improvisations and feedback																√
	Completed Tasks	√															