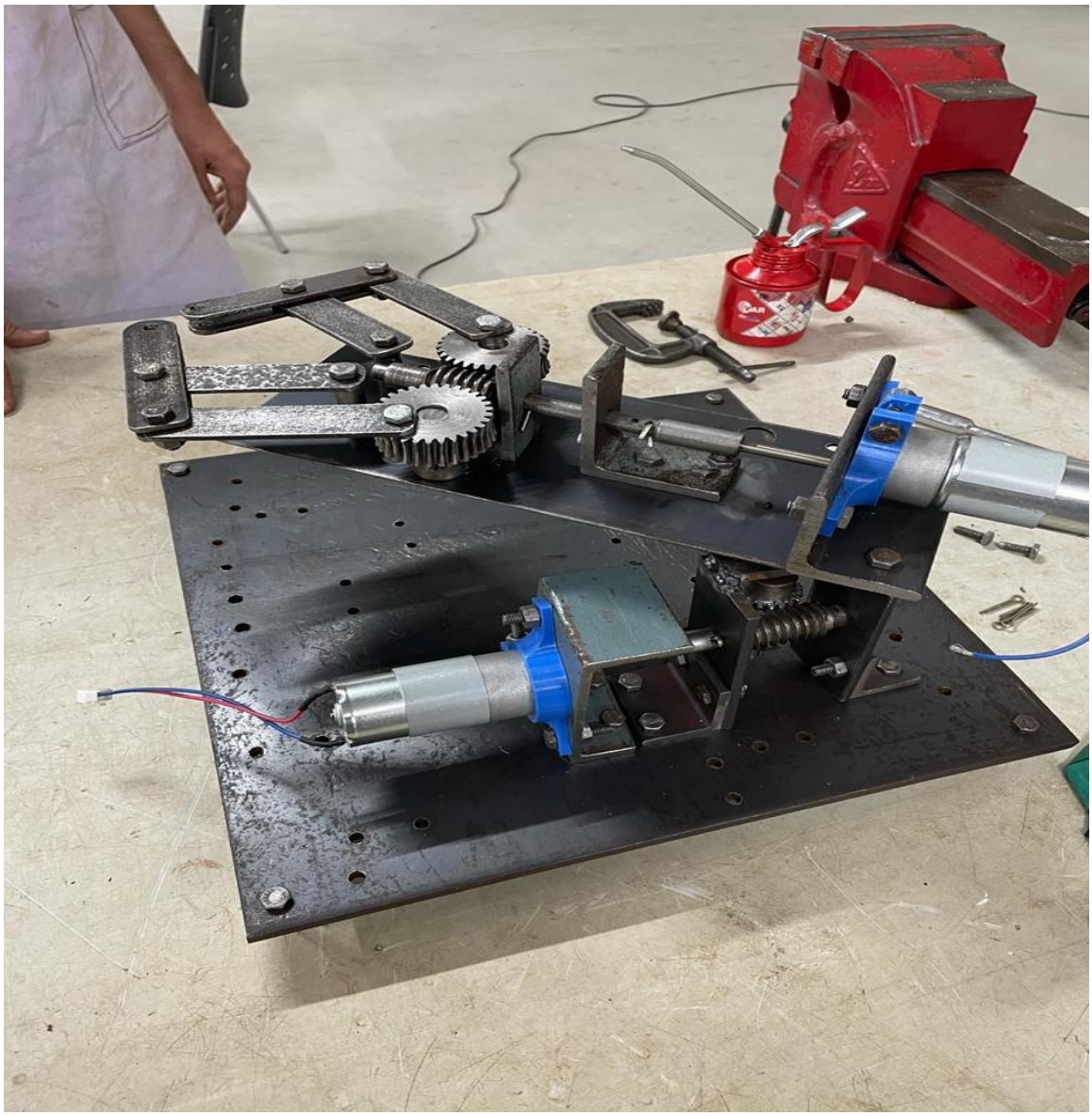
TA202 PROJECT

FOURBAR LINKAGE GRIPPER



PROJECT GROUP : **50**

INSTRUCTOR : **Prof. Arvind Kumar**

TUTOR : **Dr. Avinish Tiwari**

PROJECT GUIDE : **Mr. Rakesh Thapliyal**

Acknowledgement

We sincerely thank our tutor, Dr. Avinish Tiwari, and our TA202 laboratory guide, Mr. Rakesh Thapliyal, for their invaluable assistance and advice on this project. We could not have completed this difficult task without their moral and technical support.

We would like to thank all lab staff and our guide, Mr. Rakesh Thapliyal, for their constant supervision and encouragement, which assisted us in completing this project.

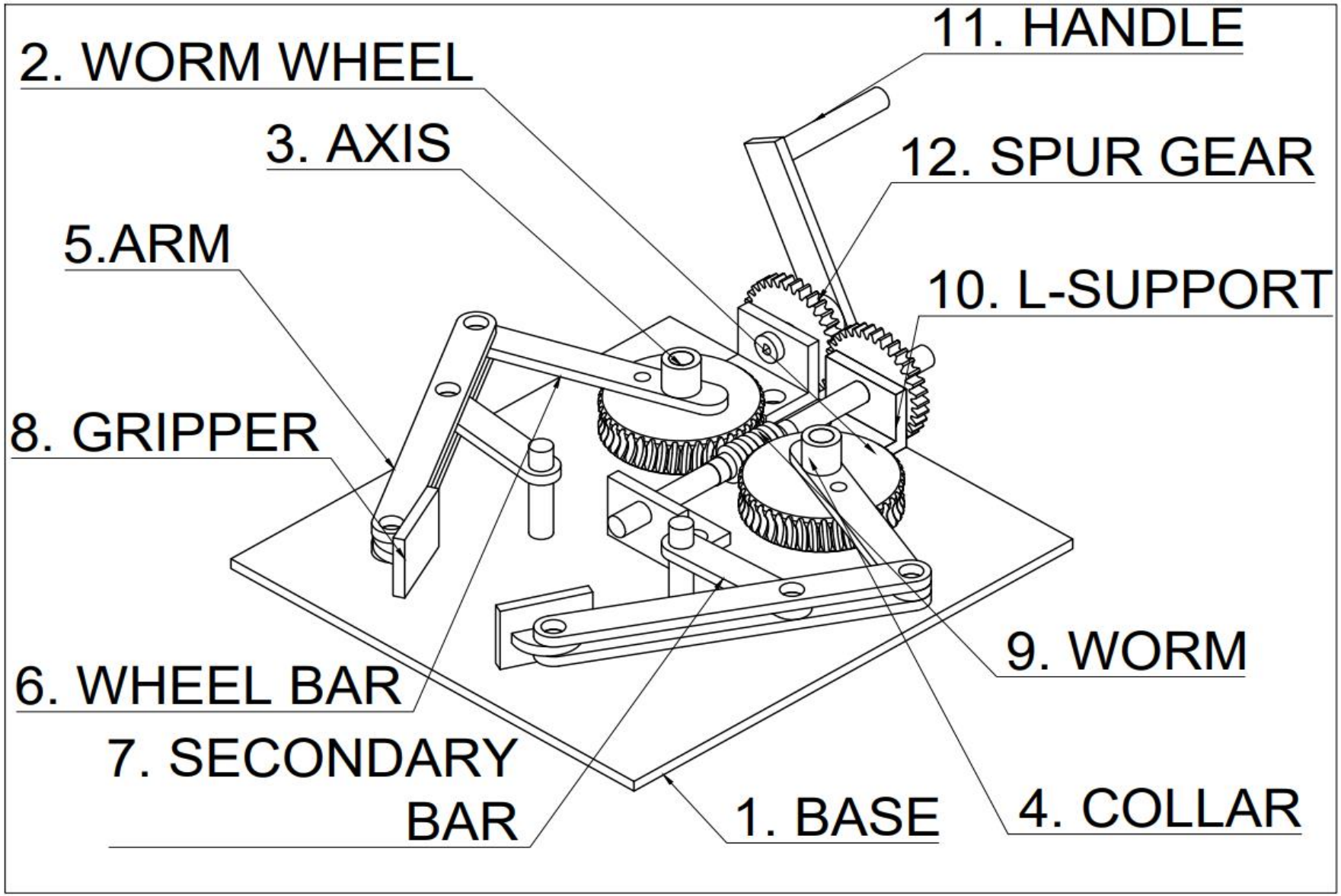
Abstract

A piece of end-of-arm tooling called a gripper is used in robots to grasp, hold, lift, move, and control the materials they are working with. Handling materials has traditionally been done with the hands of humans because it is the most common, versatile, efficient, and delicate method. However, in order to effectively replace human hands in situations involving repetitive motions, substantial loads, and harsh environments, grippers had to be invented. The purpose of this project is to develop a four-bar linkage claw gripper that can manually grasp items without the aid of any form of electrical power.

Introduction

Our machine works on the principles of conversion of rotational motion to translatory motion. A worm gear is connected to a motor that rotates about its principal axis. 2 gears are linked to this worm gear. 2 links are then respectively attached to one of the gears which rotate freely with the gear. Further 2 links containing grippers at their ends are connected to these links through a nut and bolt. A gripper is end-of-arm tooling used in a robot for grasping, holding, lifting, moving, and controlling of materials. Another motor is also used to rotate the linkage gripper along with the plate.

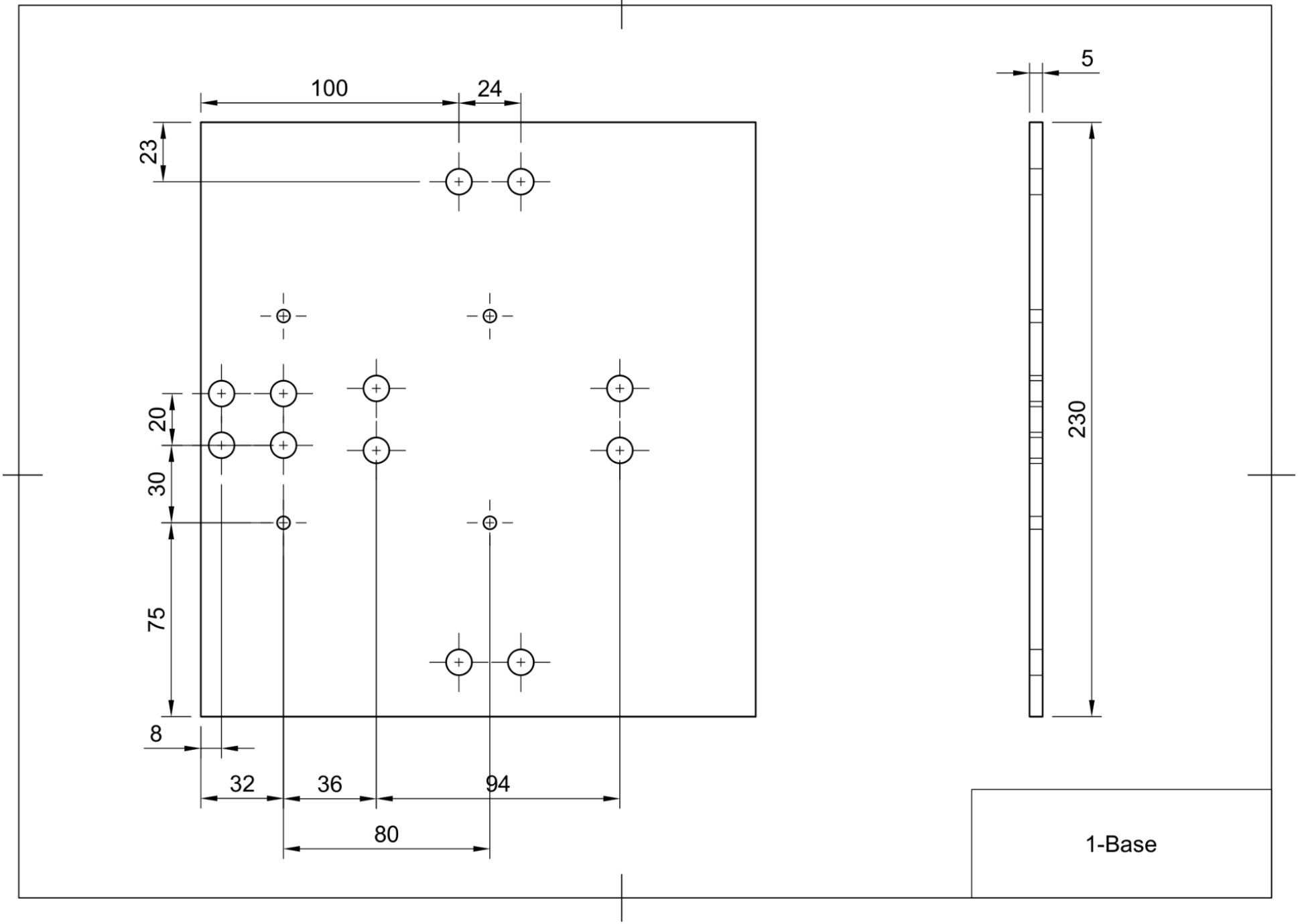
Human hands have been the most common, versatile, effective, and delicate form of material handling. But, for repetitive cycles, heavy loads, and under extreme environments, grippers had to be developed as a substitute for human hands.


11. HANDLE
2. WORM WHEEL
12. SPUR GEAR
3. AXIS
5.ARM
10. L-SUPPORT
8. GRIPPER
9. WORM
6. WHEEL BAR
7. SECONDARY BAR
1. BASE
4. COLLAR

INDEX

Part No.	Part Name	Dimension(mm)	Page No.	Quantity	Material Used	Process	Mass (kg)	Total Mass (kg)
	Isometric View		A1-A3	1	Mild Steel			
01	Base	300x300x5	1	1	Mild Steel	Conventional	3.5325	3.5325
02	Wheel	D=63.91 t=17.5di	2	2	Mild Steel	Conventional	0.4407	1.8814
03	Axis	85x10	3	4	Mild Steel	Conventional	0.0062	0.0247
04	Collar	D=14, d=7.5, H=11.35		4	Mild Steel	Conventional	0.0098	0.0391
05	Arm	150x10	4	4	Mild Steel	Conventional	0.0589	0.2355
06	Wheel Bar	104x5, R=8 d=7.5	5	2	Mild Steel	Conventional	0.0653	0.1306
07	Secondary Bar	81x5, R=8 d=7.5	6	2	Mild Steel	Conventional	0.0509	0.1017
08	Gripper	50x30 Dia=10	7	2	PLA/ABS	Conventional		
09	Worm	50.98x10.98	8	1	Mild Steel	Conventional	0.0379	0.0379
10	L-		9	8	Mild	Convention		

	Support				Steel	al		
11	Horizontal Bar	d=9.5, D=14, H=65	10	1	Mild Steel	Conventional		
12	Vertical Bar	78.3x40x3	11	2	Mild Steel	Conventional		
13	L support Type 2	30x30x6	12	2	Mild Steel	Conventional		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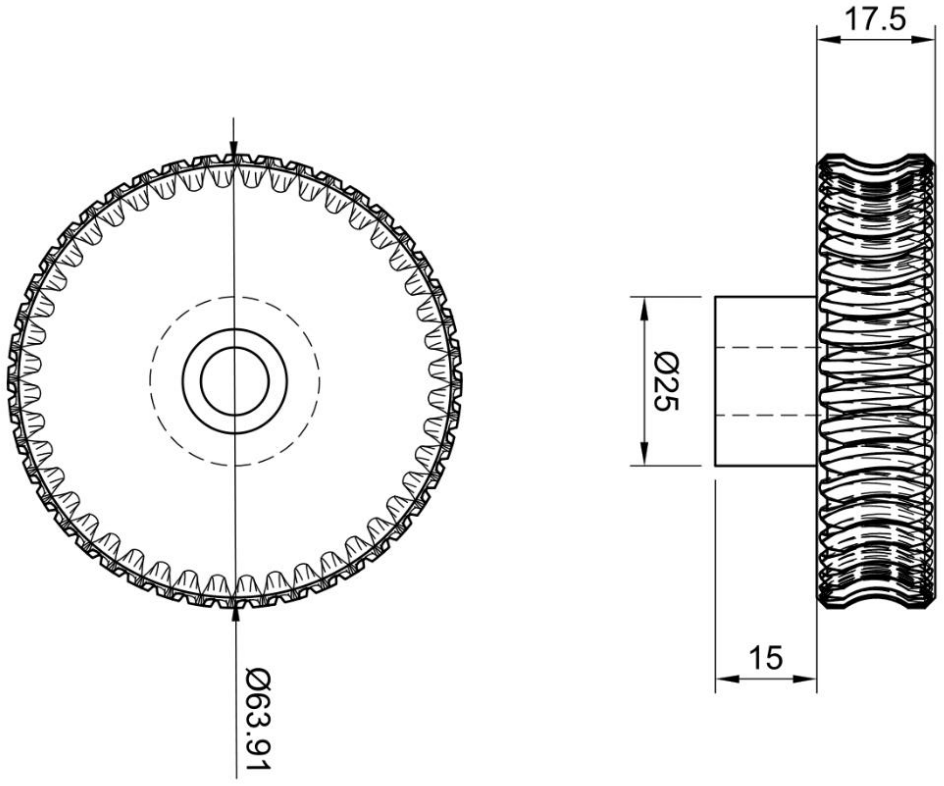
1-Base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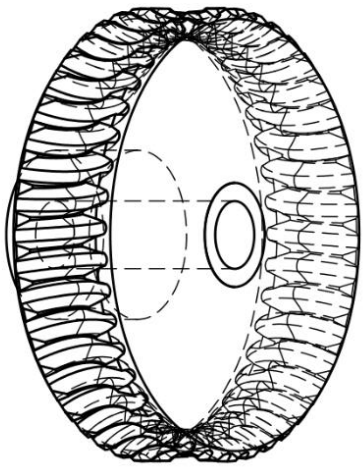

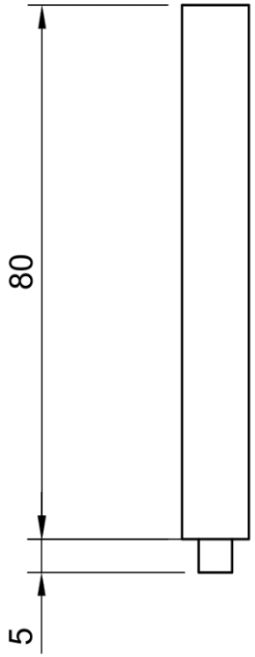

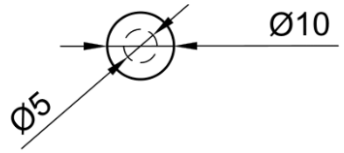

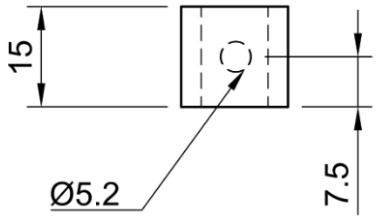

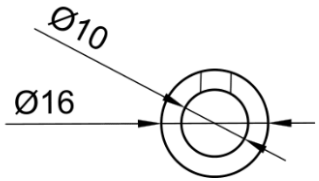

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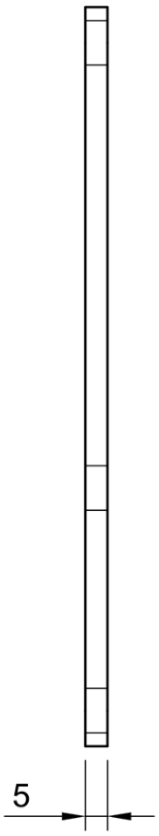
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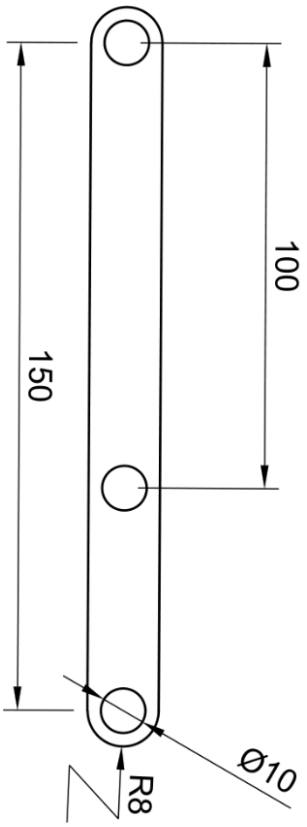
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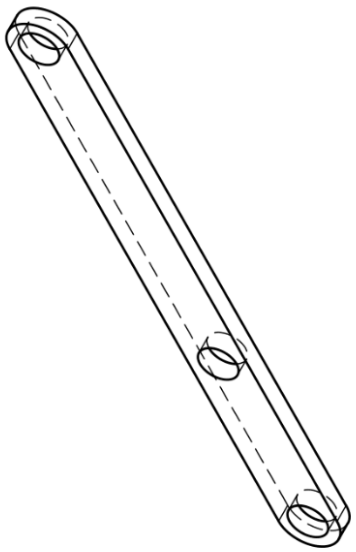

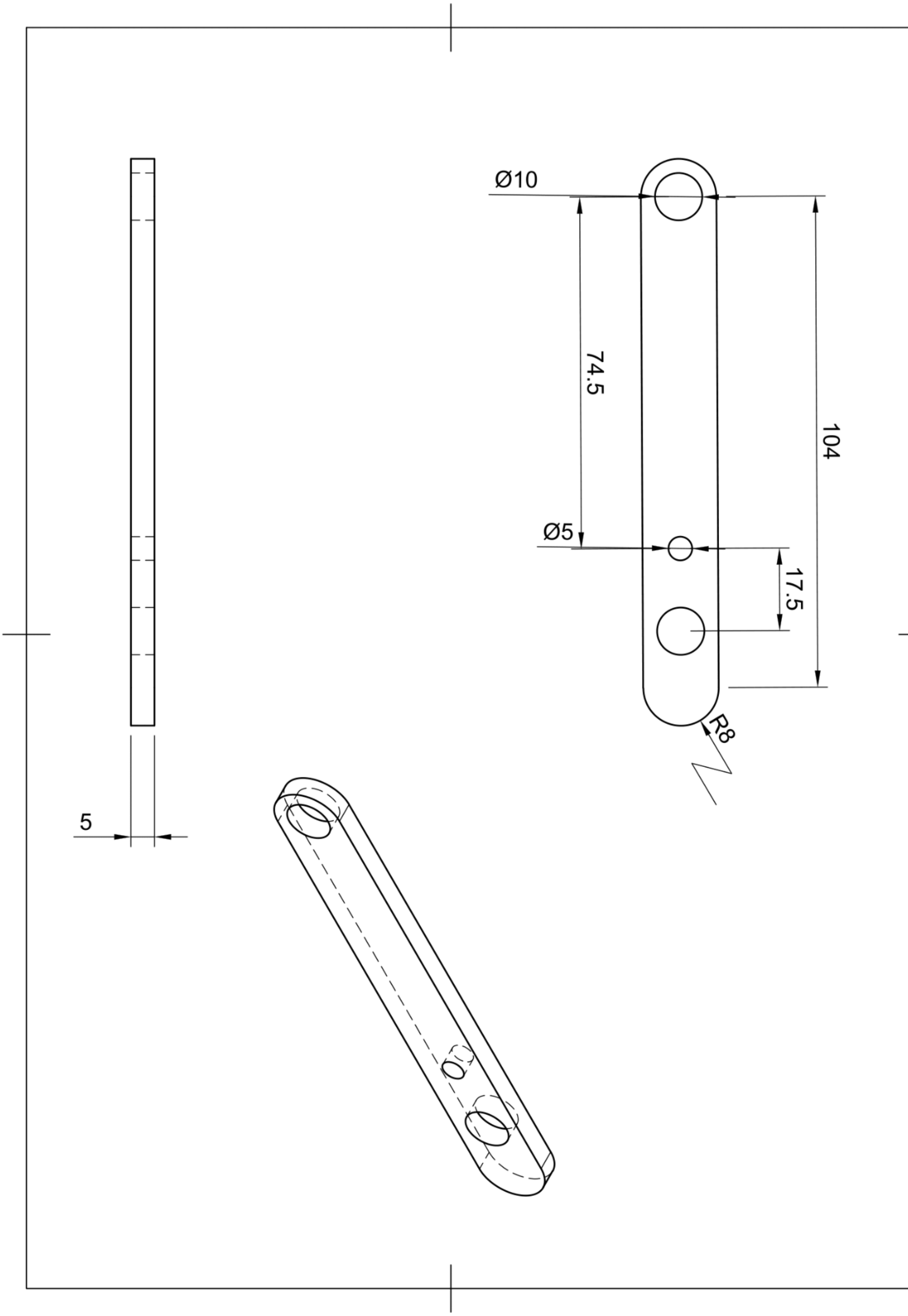
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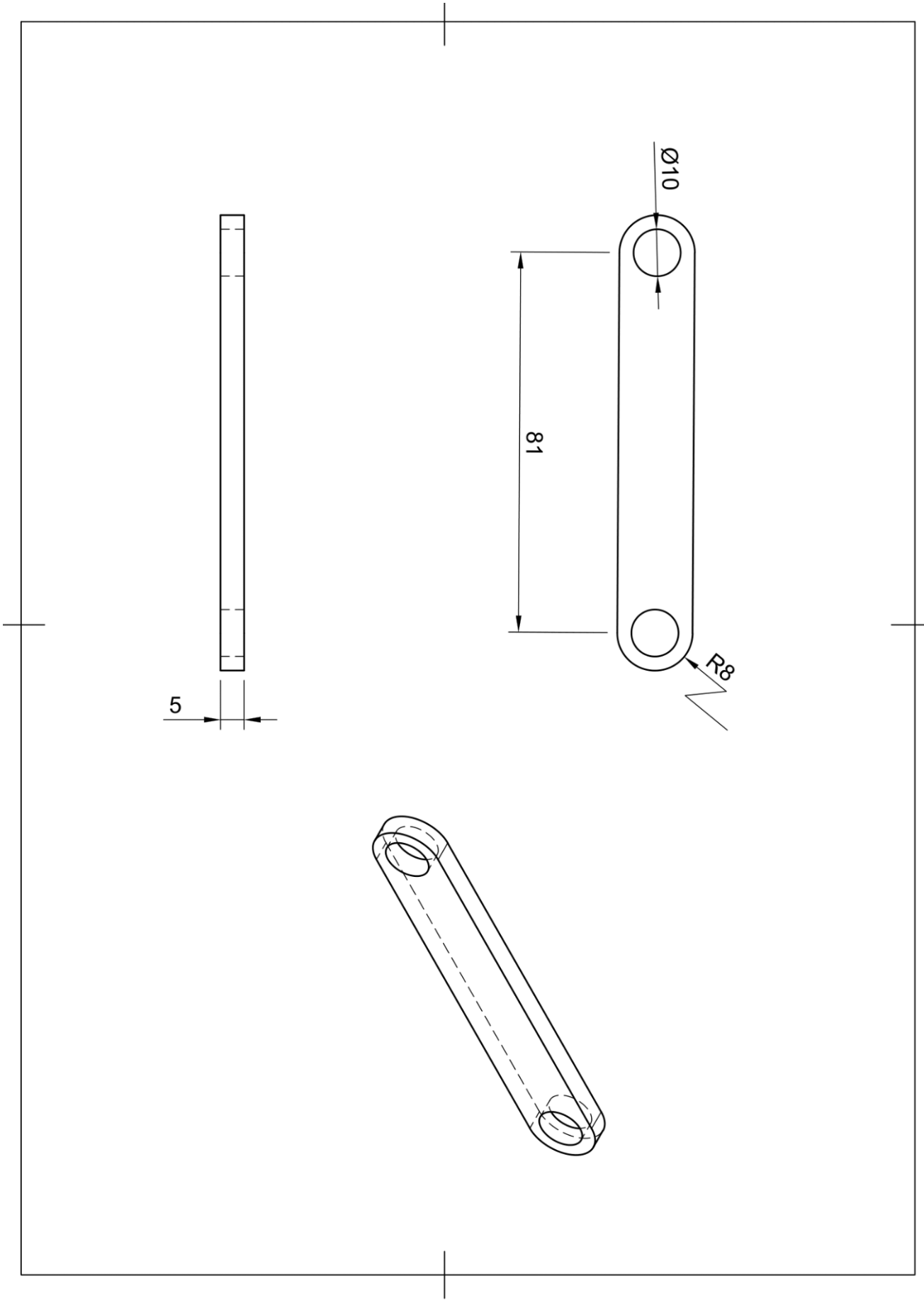
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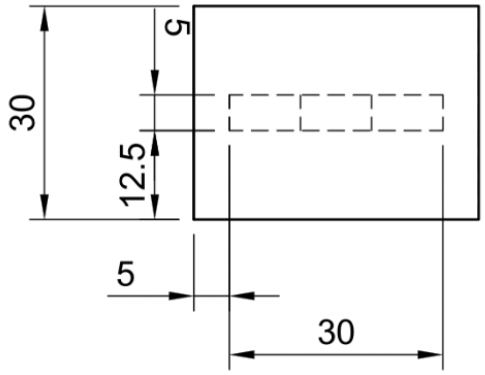

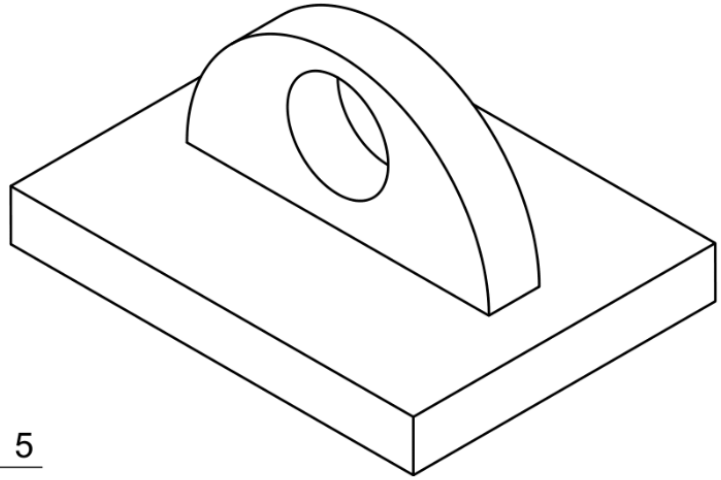

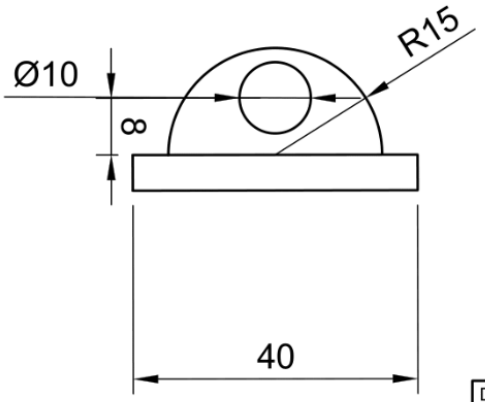

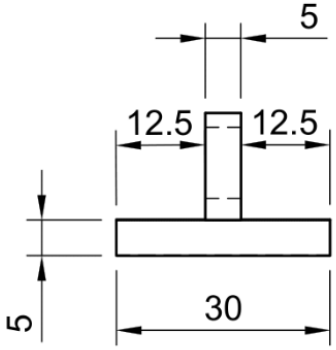

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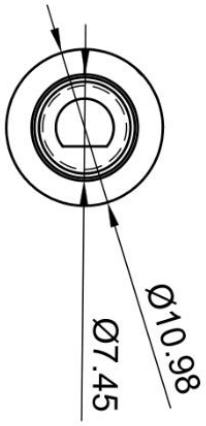
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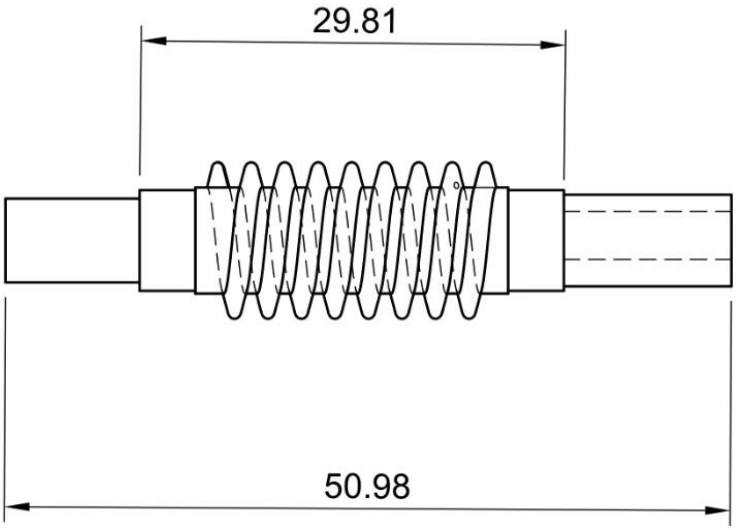
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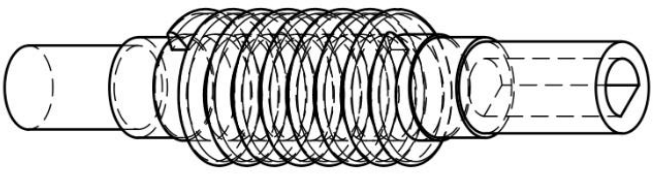

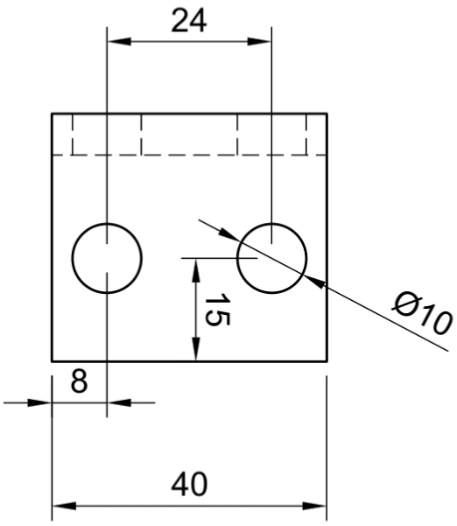
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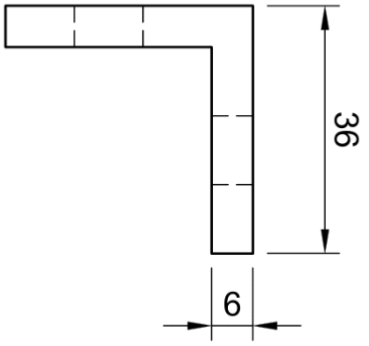
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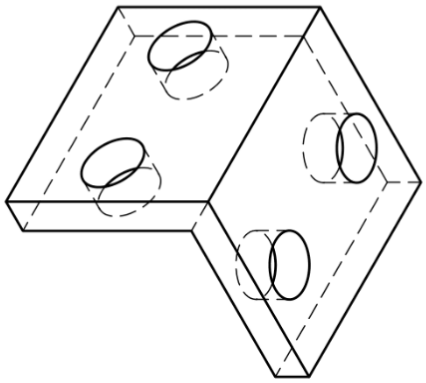

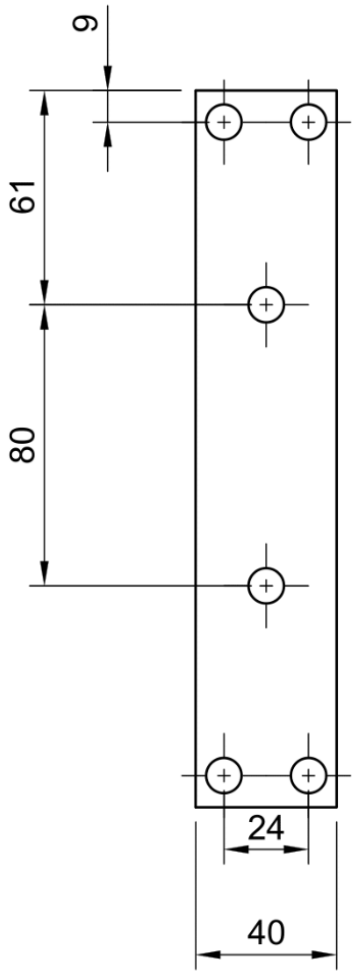

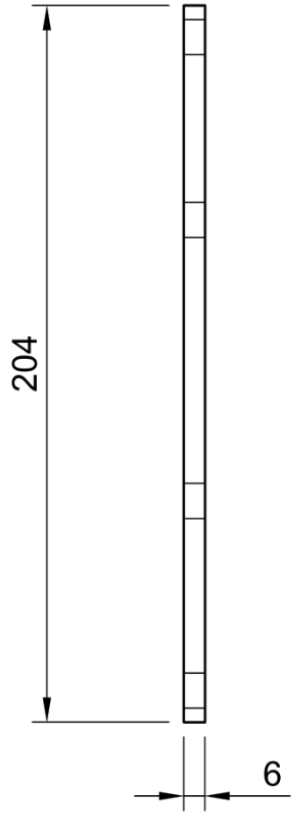

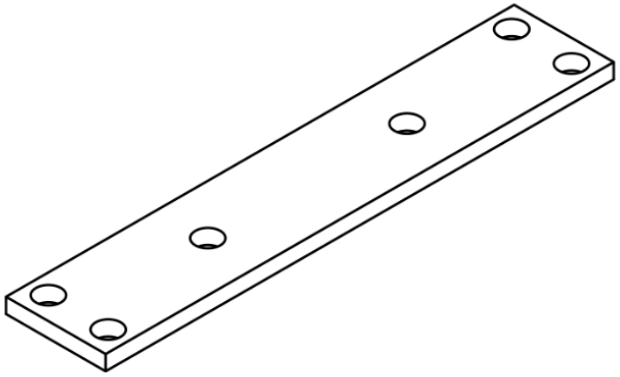

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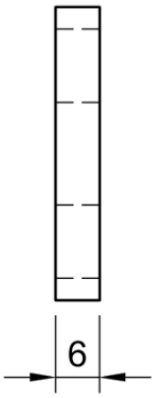
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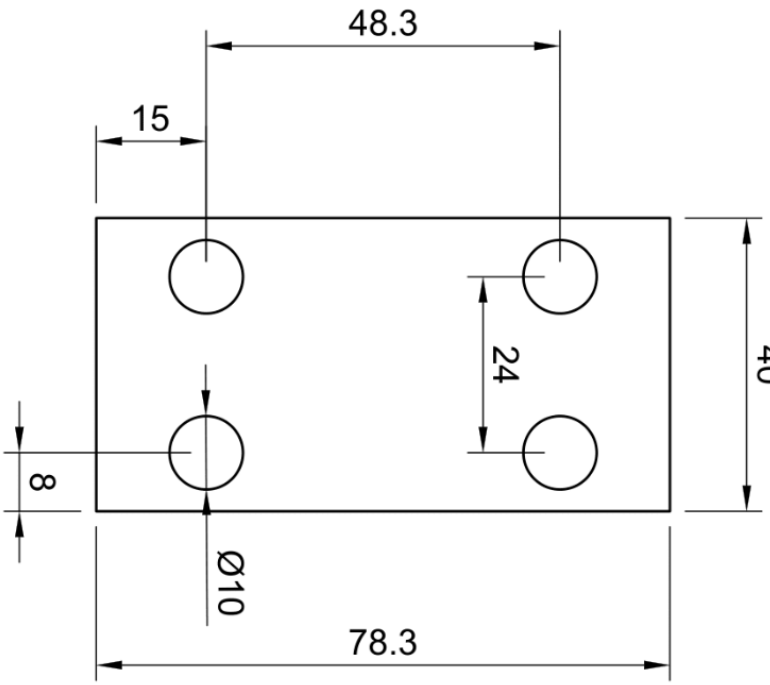
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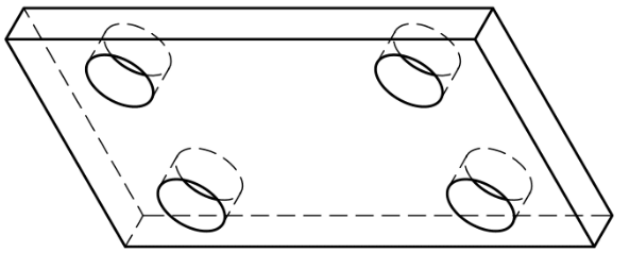

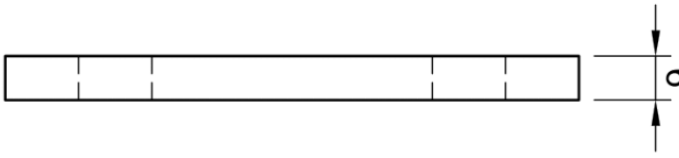
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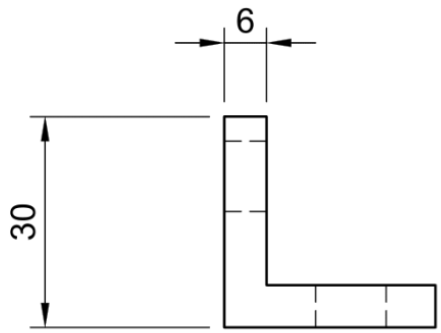

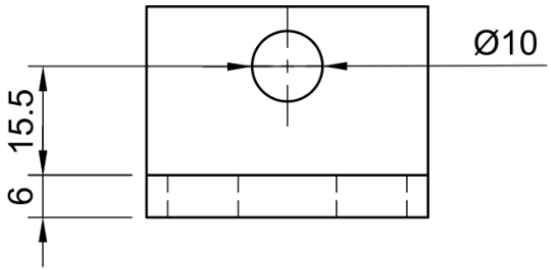

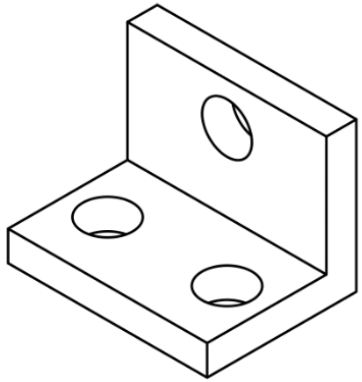

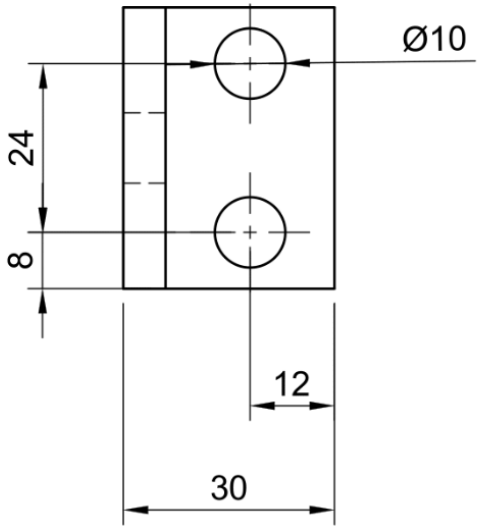

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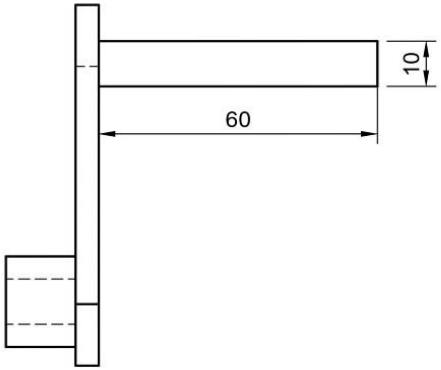

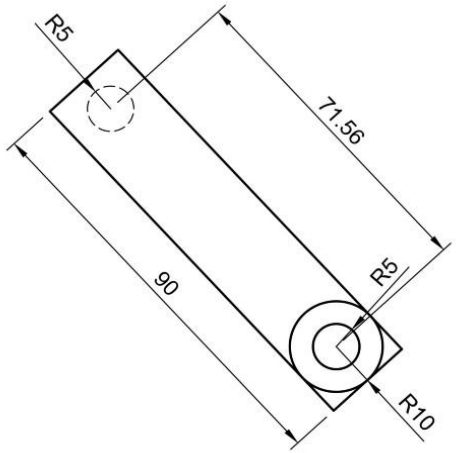

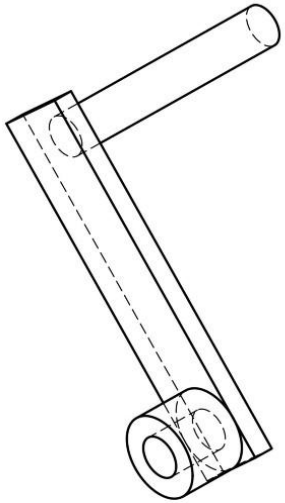

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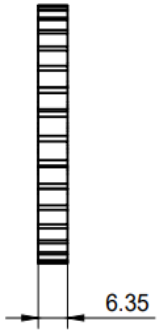
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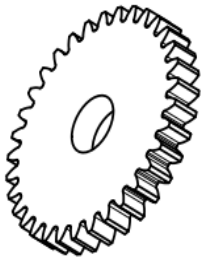

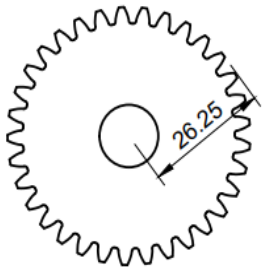
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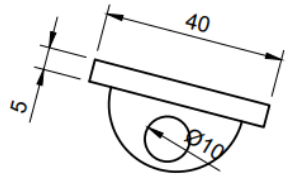
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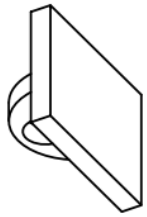


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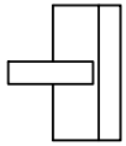

Weakness

I. Only one degree of movement of Gripper.

II. Manually controlled.

Improvements

I. Can improve the device by adding movement in pitch and x direction.
II. Integrate high power motor and sensors in the slot created so that it would run without any manual intervention.
III. Can wrap a material around the gripper with a high coefficient of friction.

COST ANALYSIS

- **Material Cost**

Parts	Qty	Material	Total Mass(kg)
Base	1	Mild Steel	3.5325
Wheel	2	Mild Steel	1.8814
Axis	4	Mild Steel	0.0247
Collar	4	Mild Steel	0.0391
Arm	4	Mild Steel	0.2355
Wheel Bar	2	Mild Steel	0.1306
Secondary Bar	2	Mild Steel	0.1017
Worm	1	Mild Steel	0.0379
Total	**20**		7.5322

Total Cost = 7.5322 x 90

= 677.898

- **Machining Cost**

1.	**Lathe**	1 x 350	Rs 350
2.	**Milling**	0.5 x 450	Rs 225
3.	**Drilling**	1.5 x 100	Rs 150
4.	**Cutting**	0.33 x 60	Rs 19.8
5.	**3D Printing**	1.5 x 300	Rs 450
	TOTAL		**Rs 1194.8**

- **Labour Cost**

Skilled Labour = 5.5(hrs) x 850/8 = Rs 584.375

Unskilled Labour = 7(hrs) x 650/8 = Rs 568.75

Total = Rs 1153.125

Entire Cost = Rs 3025.823