

DESIGNING A MECHANICAL WRIST SYSTEM USING MECHANICAL RIM BRAKING SYSTEM.

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Abstract: People who born with a single hand and those who lost their hand during accident were facing a problem while lifting things. Our project aimed to help those people by designing a mechanical wrist system. This could be done by using a mechanical wire braking system. In our design we used aluminum metal sheet for processing. This aluminum gives the advantages of light weight. So this can lift things easily without facing any strain. The aluminum metal was cut and grained for the respective size. Then it is shaped and bended in-ordered to fix on the finger joints. Our developed system gives the feel of comfortable lifting for physically challenged people and it also gives cost advantages.

IndexTerms–*Mechanical wrist, Mechanical Braking System, Physically challenged people*

I. INTRODUCTION

About 15% of the world's population lives with some form of disability, of whom 2-4% experience significant difficulties in functioning. Disability is impairment be cognitive, developmental, intellectual, mental, physical, sensory, or some combination of these. It substantially affects a person's life activities and may be present from birth or occur during a of person's lifetime. People with hand disability also have a considerable ratio in our society.

Our project aims to serve people with one hand disability, by designing a mechanical wrist system using mechanical rim braking system. This braking force is applied by a friction pads. In our case aluminum acts as a friction pad. The break wire connected with glove transfer the mechanical movements into linear motion. Disabled person can able to move the affected hand as the same way of normal hand without feeling any stress. Aluminum metal used in the finger joints, it gives less wait as well as cost advantage. This process could be achieved by different fabrication methods like cutting, grinding, bending and shaping.

II. METHODOLOGY

In our design methodology, we used aluminium metal for fabrication process this includes the following stages such as cutting, grinding, bending and shaping. Cutting is a collection of processes wherein material is brought to a specified geometry by removing excess material using various kinds of tooling to leave a finished part that meets specifications.

Then grinding process is carried out. Each grain of abrasive on the surface cuts a small chip from the work piece via shear deformation. Bending process is done by bending the edges of aluminum metal sheet. Finally the metal is shaped in-ordered to get the desired shape.

III. DESCRIPTION OF PARTS

The parts used in our project were listed below

- Aluminum Sheet
- Steel wires
- Glove

3.1 Aluminium

Aluminum sheet is a chemical element in the boron group with symbol Al and atomic number 13. It is a silvery-white, soft, nonmagnetic, ductile metal. By mass, aluminum makes up about 8% of the Earth's crust. It is the third most abundant element after oxygen and silicon and the most abundant metal in the crust, though it is less common in the mantle below.

Aluminum sheet is low density and high strength, superior malleability, easy machining, excellent corrosion resistance and good thermal and electrical conductivity are amongst aluminum its properties of aluminum sheet. The corrosion-resistance property gives the metal a long life and keeps it looking good throughout its life. One of the best known properties of aluminum is that it is light, with a density one third that of steel, $2,700\text{kg/m}^3$

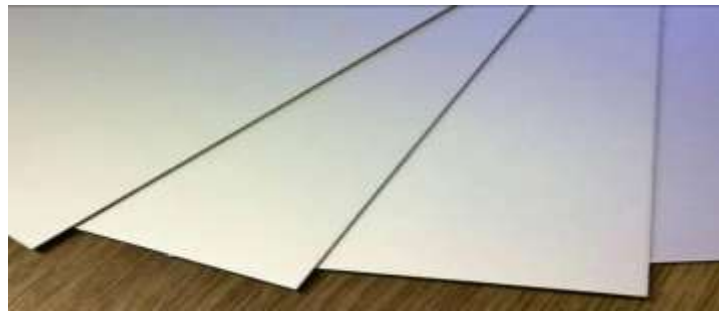


Fig1.1 Aluminium sheet

3.2 Steel wire

The steel wire is a single, usually cylindrical and flexible strand or rod of metal. Wires are used to mechanically load or electricity and telecommunication signals. Wire is commonly formed by drawing the metal through a hole in a die or drawn plate. Wire comes with solid core, stranded, or braided forms. Although usually circular in cross section, wire can be made in square, hexagonal, flattened rectangular or other cross-sections.

The steel wires properties on excellent corrosion resistance. Good weld ability and good formability. The stainless steel major advantages for use in stainless steel very convenient which do not need to have high expertise. In the use of some simple stainless steel electric heating tube, it only needs to have steel electric heating tube, it only needs to connect the electrically to control on and off, so it has been widely recognized on market promotion.

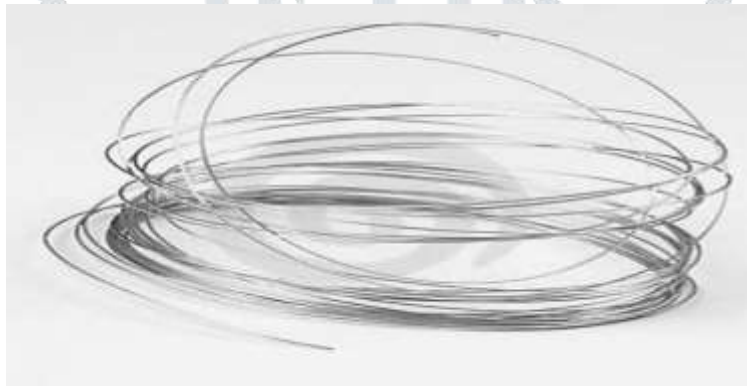


Figure: 4.2 Steel wire

3.3 Gloves

Gloves are made of materials include cloth, knitted or felted wool, leather, rubber, latex, neoprene and metal gloves of clever protect the wearer from cuts. A glove is a garment covering the whole hand. Gloves have separate sheaths or openings for each finger and thumb. Gloves protect and comfort hands against cold or heat, damage by friction, abrasion or chemicals, and disease. Gloves combine toughness and environmental protection with a degree of sensitivity and flexibility.



Figure: 4.3Gloves

IV. SELECTION OF MATERIALS

Table 4.1: Materials used

COMPONENTS	MATERIAL	SPECIFICATIONS
Sheet	Aluminum	Thickness-0.5mm
Wire	Steel	Diameter-1mm
Glove	Leather	1 set

V. PROCESS SELECTION

- Cutting
- Grinding
- Lathe operations
- Bending
- Drilling
- Shaping

VI. WORKING PRINCIPLE

The section describes the working of mechanical wrist with wire break mechanism for physically challenged people. Wire break mechanical joints were fixed on our finger joints of one hand using aluminum metal. This wire break mechanical hand employed as a normal hand. Unaffected hand serves as a reference hand. The respective movements from the unaffected hand transferred to the affected hand through mechanical braking system.

This could be achieved by cutting an aluminum metal as per the required size, and then it's grained. The grained metal was shaped in a respective manner and then bended to fix in the finger joints. Finally it is tighten by using a wire. This entire setup will act as a mechanical wrist. Wire breaks were connected between the developed model and gloves connected with reference hand. Whenever changes or movements presented that could be transferred to the developed model by wire braking mechanism. In order to reduce the weight of the system aluminum metal plates were used.

VII. COST ESTIMATION

Table 7.1: Cost Estimation

COMPONENT	COST OF PIECE(RS)	NUMBER OF PIECES	TOTAL COST(RS)
Aluminum Sheet	600	1	600
Gloves	800	1	800
Steel Wire	500	1	500
Tubes	300	1	300
Labour cost			1200
Total cost			3400

VIII. APPLICATIONS

- Highly applicable for physically challenged people.
- Suitable for people who lost their hands during accident.
- Used as normal hand while handling hazarded chemicals.
- Used to handle tough materials.
- The flexible using on the peoples.

IX. ADVANTAGES AND DISADVANTAGES

9.1 ADVANTAGES

- Light weight
- More flexible for physically changed people
- Lowest cost
- Used as normal hand while handling hazarded chemicals.
- Very easily working the process.

9.2 DISADVANTAGES

- More weight cannot be lifted

X. CONCLUSION

The design and fabrication work of mechanical wrist system by using wire break mechanism was carried out successfully. This project serves as a comfortable and stress free hand for a physically challenged people like the way of normal hand. The very useful the physically changed people and normal hand people like. This can be finally analyzed mechanical wrist.

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