

EXO-SKELETON ARM

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ABSTRACT

This paper consists the work of design and modeling of an exo-skeleton arm mechanism. Major consideration was taken on weight lifting by boosting the strength of the wearer. Various experimental tests were done. Kinematic analysis of the proposed design and system were carried out. It is expected the proposed design will help in many mechanical fields.

Keyword: skeleton, lifting, power, arm

1. Introduction

Powered exo-skeleton, which is also known as powered exo-frame, is a mobile machine which consists primarily an outer frame work that can be worn by a person, and can be powered by a system of motors to deliver power for limb movement.



Fig.1

The main function of an exo-skeleton arm is assisting the wearer by increasing their strength and power to lift heavy objects.

2. History of Exo-skeleton

Role of Exoskeleton

Exo-skeleton contain rigid and resisting components that fulfill the essential roles like protection, sensing, support, feeding and acting as barrier from pests and predators in terrestrial organisms.

Diversity

Different species produce different exoskeletons composing of a range of materials such as bone and cartilage.

Growth in an Exo-skeleton

As exo-skeletons are rigid, they show some limits in growth. Organisms with open shells can show growth by adding new material to their shell.

3. Methodology

The method used in this project is prototype analysis.

In this method, we study the prototype and then start to fabricate it. Considerations like weight and strength will be taken.

This part of the paper consists three parts:-

- 3.1 Assembly parts
- 3.2 Working of the System
- 3.3 Flow diagram of Working

3.1 Assembly parts

Five parts have been used in our project work:-

- Fore arm link

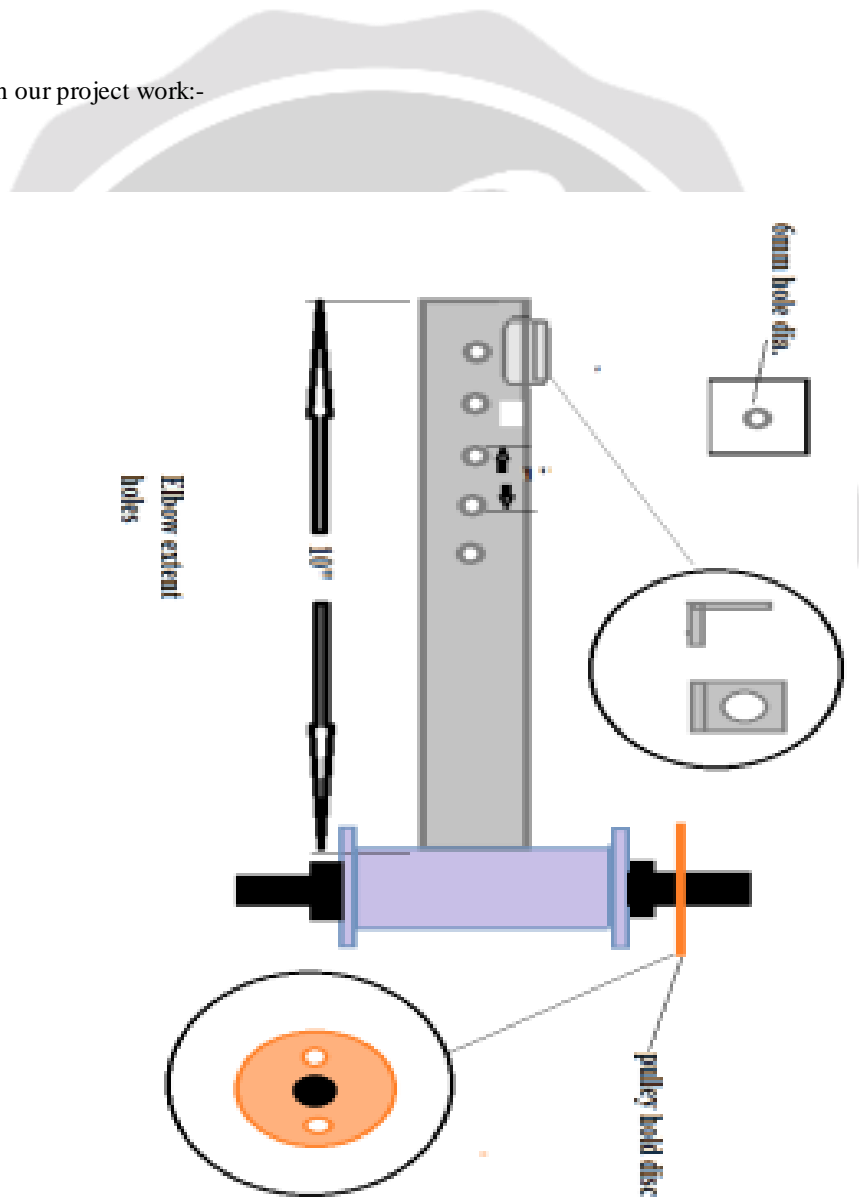


Fig.2

- Extent of fore arm
- Arm links & joints

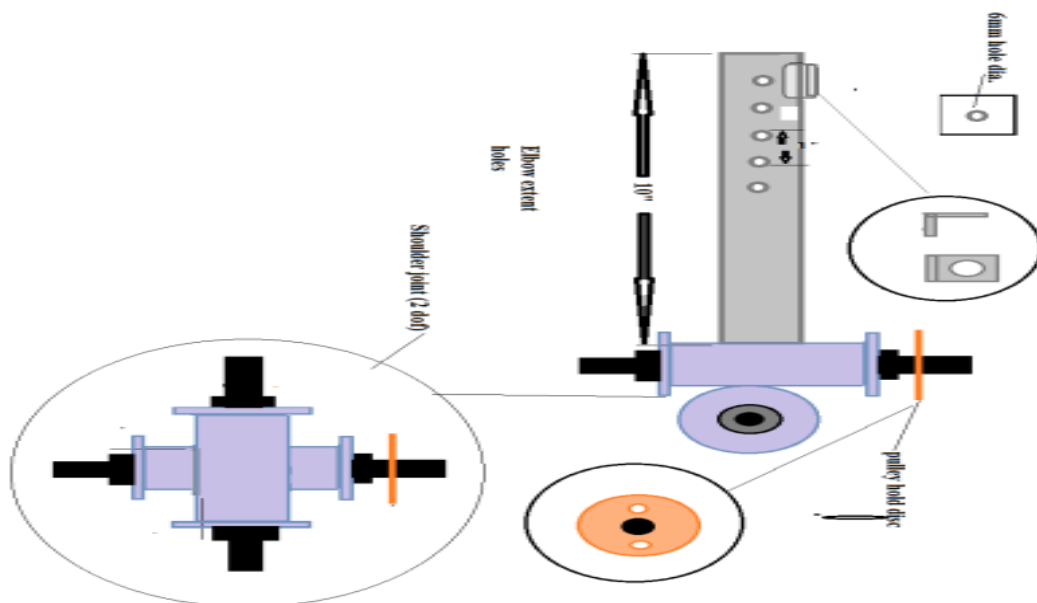


Fig. 3

- Extent of fore arm
- Shoulder attachments
- Circuitry

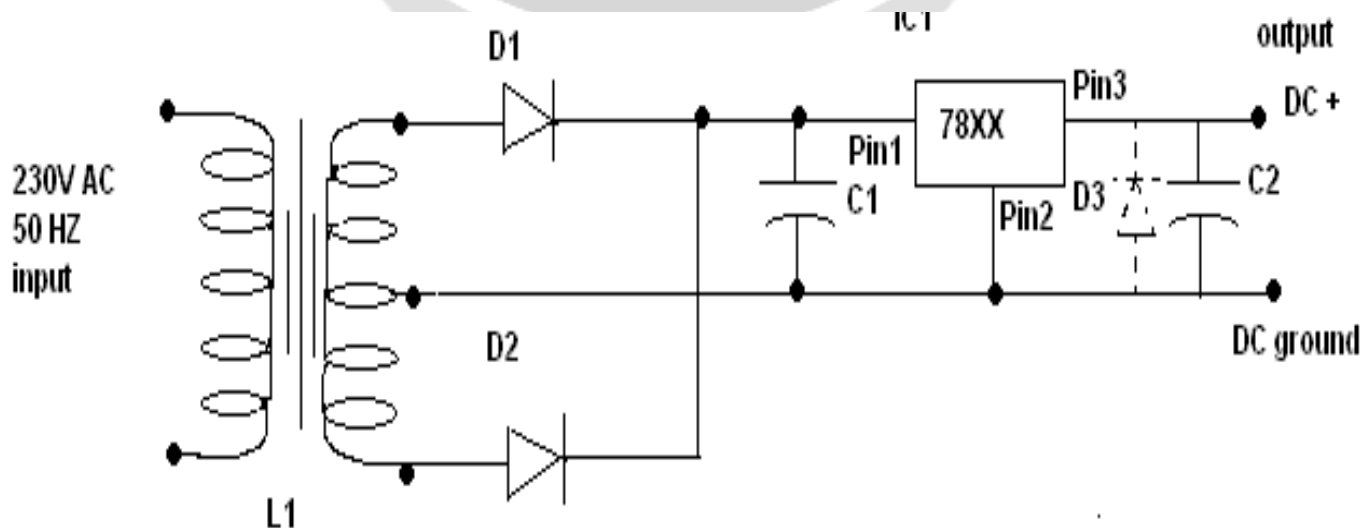


Fig. 4

3.2. Working of the System

The main purpose of the exo-skeleton arm is to provide an increase in power with movement which will be manipulated with the action of the human body.

According to the movement of human arm, our exo-skeleton arm manipulate the movement of the motor. Pneumatically-powered ankle exo-skeleton is controlled by the user own movement.

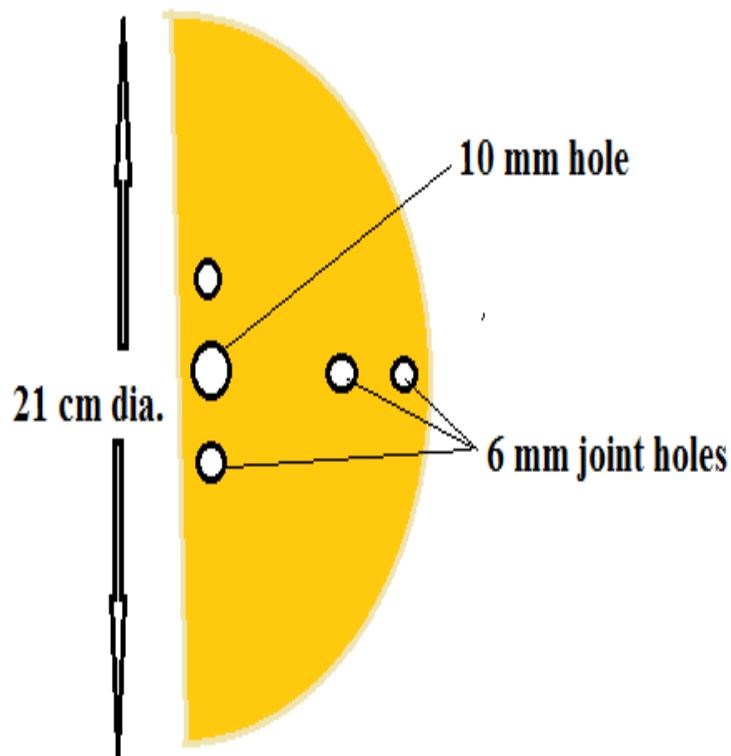


Fig. 5

3.3. Flow diagram of Working



Fig. 6

4. Rechargeable battery

A rechargeable battery or storage battery is a type of an electrical battery. It consists of one or more electrochemical cells, and is a type of accumulator for electrochemical energy storage. It is technically a secondary cell because its electrochemical reactions are electrically reversible.

Rechargeable batteries are available in different shapes, sizes and megawatts. Different combinations of chemicals are used, including nickel cadmium (NiCd), nickel metal hydride (NiMH), lithium ion (Li-ion), and lithium ion polymer (Li-ion polymer).



Fig. 7

5. Application

- Enabling a soldier to carry heavy objects while running or climbing.
- Not only it increases soldier potential to carry more weight, but he could presumably wield heavier armors and weapons.
- Another application is in medical field, particularly nurses, to move heavy patients.
- It can be also used for tele-operation and power amplification

6. Results and discussion

- Maximum weight capacity is taken as 8kgs.
- The weight including batteries can be improved by 4 to 5 kgs.

7. Conclusion

- The timing for actuation is appropriate for heavy-lifting.
- The transmission matches the movement of the parts of exo-skeleton.
- The system is light weight, so it can be made of light material like aluminium.
- The weight increment due to battery exceeds 10 kgs.

8. Future scope

- The project work can be done by taking some material considerations.
- Android system can be added to the circuitry

9. References

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