

# WHEEL CHAIR AUTOMATOR

S R Sasidhar Naidu<sup>1</sup>, C Sreekanth Reddy<sup>2</sup>, Sathish Kumar V S<sup>3</sup>

1. B.Tech student in mechanical engineering, MTIET, INDIA

2. B.Tech student in mechanical engineering, MTIET, INDIA

3 Assistant professor, department of mechanical engineering MTIET, INDIA

**ABSTRACT:** - Wheelchairs have been used for transporting patients as well as disabled for quite a long time. Wheelchairs are driven by manual efforts. The disabled drive wheelchairs by their hands while another person is required to push patient's wheelchair. Here we propose a simple attachable extension that can be attached to a wheelchair and can transform wheelchairs into E wheelchairs that require no manual efforts. Also, the system makes use of batteries to drive the wheelchair and no fuel-based engine which makes it eco-friendly. The E wheelchair attachment is designed to automate wheelchairs and thus achieve efficient and easy transportation medium to patients as well as disabled people.

**Keywords:-** Wheel chair, Electric Hub motor, Motor Controller

## 1. INTRODUCTION

One-fifth of the estimated global population, i.e. between 110 million and 190 million people, experience significant disabilities. Disabilities of various parts such as eye, ear, hand, leg etc. Limb disability is one of the disabilities which are caused due to various reasons such as deformation by birth, war, disorders such as diabetes. Lower limb of sports person also suffers huge blows while playing and are always at the risk of suffering severe injuries. These injuries sometimes may be a permanent disability.

## 2. LITERATURE REVIEW

The existing manual wheel chairs have hand and rim propulsion system, which requires more efforts. In order to come up with a better manual propulsion system to effectively minimize the physical strain on the wheel chair users, we referred some websites and found these below information

**Current products:** - There are a number of different products available on the market at the moment that could be used by a disabled user for the purpose of a tricycle. The extent to which these are suitable for purpose varies and there must be an awareness of alternative products to ensure a unique design with a potential market that is not already being capitalised on is available.

- NON SPECIFIED TRI CYCLES[1]
- DISABILITY SPECIFIC TRI CYCLES[2]

## 3 COMPONENTS IN WHEEL CHAIR AUTOMATOR

### MECHANICAL COMPONENTS

S.no	Components	Quantity
1	FRAME	1
2	BEARING 2.1 steering bearing	1
3	BRAKING 3.1 Brake Drum 3.2 Caliper	1 1
4	STEERING COMPONENTS 4.1 Fork 4.2 Head Tube 4.3 Headset Bearing 4.4 handle bar	1 1 1 1
5	Fabrication material 5.1 Mild Steel 5.2 sheet metal	8kgs 4x4 inches

### ELECTRICAL COMPONENTS

1	Lead-Acid Battery	(12v, 24AH)	4
2	Electric Hub motor	500 Watts	1
3	Miniature Circuit Breaker (MCB)	240v	1

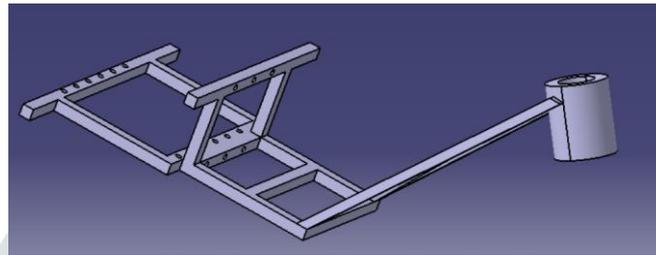
4	Motor Speed controller	48v	1
5	Output regulator	12v	1
6	Throttle (Acceleration)	Handle	1
7	DC Lead acid Battery Charger	220v AC to 48v DC converter	1

**FRAME(CHASIS): -**

Material: - mild steel

Weight: - 12kgs

The frame should be having high strength which would be need to hold at least 100kgs of load in order to carry a one passenger and battery (self -weight) overall. I choose **MILD STEEL** as material because it is much tougher and easier to weld than materials such as aluminium... etc., Uprights for head tube and fitting chassis and other components could be welded to the main structure.



**Fig: - CHASIS**

**BRAKE:**

We used Both types of brakes in this project. They are: -

**DRUM BRAKE:** - A drum brake is a brake in which brake shoes with lining (friction material) attached to them are pushed by hydraulic pistons against the inner surface of a drum rotating together with the axle. This generates friction, which converts kinetic energy into heat and slows or stops the drum and the attached wheel.

Drum rotation helps to press the shoes and the lining against the drum with more force, offering superior braking force in comparison with disc brakes. However, since the friction surface of the drum is enclosed and not exposed to air flow, it cannot dissipate heat into the atmosphere as effectively as a disk brake.



**Fig: - Drum brake**

**CALIPER BRAKE:** - The calliper brake is a class of cable-actuated brake in which the brake mounts to a single point above the wheel, theoretically allowing the arms to auto-centre on the rim. Arms extend around the tyre and end in brake shoes that press against the rim. While some designs incorporate dual pivot points — the arms pivot on a sub-frame — the entire assembly still mounts to a single point.

Calliper brakes tend to become less effective as tyres get wider, and so deeper, reducing the brakes' mechanical advantage. Thus, calliper brakes are rarely found on modern mountain bikes. But they are almost ubiquitous on road bikes, particularly the dual-pivot side-pull calliper brake.



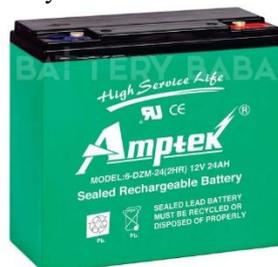
**Fig: - CALIPER BRAKE**

**STEERING COMPONENTS: -**

The components used for steering are: -

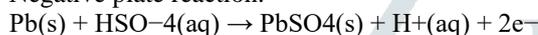
1. Fork
2. Head tube
3. Headset bearing
4. Handle bar

**Lead-Acid Battery** The battery which uses sponge lead and lead peroxide for the conversion of the chemical energy into electrical power, such type of battery is called a lead acid battery. The lead acid battery is most commonly used in the power stations and substations because it has higher cell voltage and lower cost. The grid structure of the lead acid battery is made from a lead alloy. These batteries are often known as “lead-antimony” and “lead calcium.”

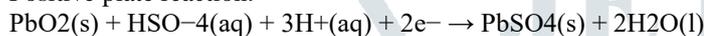


**Fig 3.16 Lead-Acid Battery**

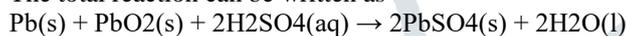
Negative plate reaction:



Positive plate reaction:



The total reaction can be written as



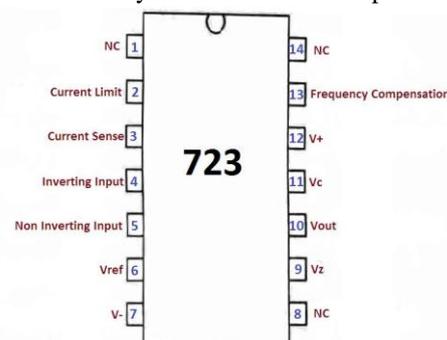
The sum of the molecular masses of the reactants is 642.6 g/mol, so theoretically a cell can produce two faradays of charge (192,971 coulombs) from 642.6 g of reactants, or 83.4 ampere-hours per kilogram (or 13.9 ampere-hours per kilogram for a 12-volt battery). For a 2 volts cell, this comes to 167 watt-hours per kilogram of reactants, but a lead-acid cell in practice gives only 30–40 watt-hours per kilogram of battery, due to the mass of the water and other constituent parts.

**ELECTRIC HUB MOTOR: -** The wheel hub motor (also called wheel motor, wheel hub drive, hub motor or in-wheel motor) is an electric motor that is incorporated into the hub of a wheel and drives it directly.



**FIG: - ELECTRIC HUB MOTOR**

**Motor Speed controller: -** An electronic speed control or ESC is an electronic circuit that controls and regulates the speed of an electric motor. It may also provide reversing of the motor and dynamic braking. Miniature electronic speed controls are used in electrically powered radio-controlled models. Full-size electric vehicles also have systems to control the speed of their drive motors.



**FIG:- MOTOR SPEED CONTROLLER**

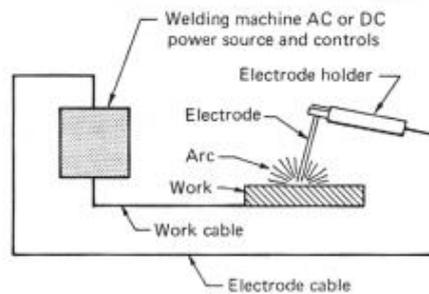
#### 4 ASSEMBLING

Sequence order of assembly

- Chassis
- Fork
- Upper yoke
- Headset
- Lower yoke
- Handle bar
- Wheel
- Wheel chair

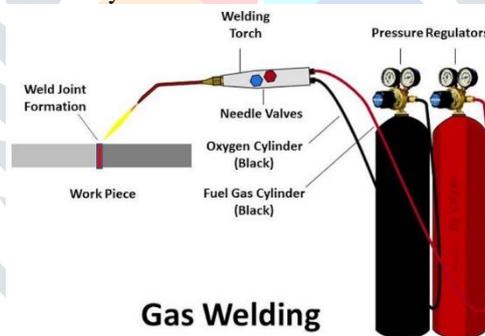
#### ARC WELDING: -

Arc welding is one of several fusion processes for joining metals. By applying intense heat, metal at the joint between two parts is melted and caused to intermix - directly, or more commonly, with an intermediate molten filler metal. Upon cooling and solidification, a metallurgical bond is created. Since the joining is an intermixture of metals, the final weldment potentially has the same strength properties as the metal of the parts. This is in sharp contrast to non-fusion processes of joining (i.e. soldering, brazing etc.) in which the mechanical and physical properties of the base materials cannot be duplicated at the joint. [3]



#### GAS WELDING: -

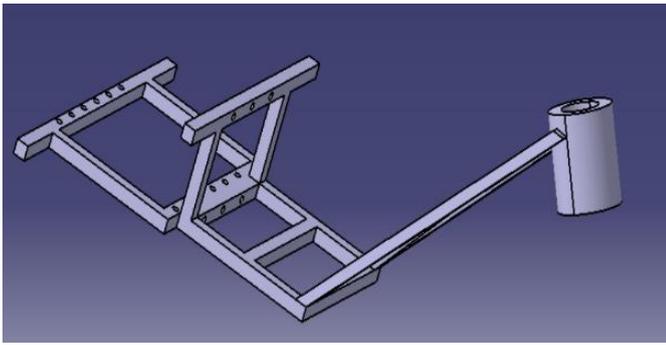
Gas welding is a most important type of welding process. It is done by burning of fuel gases with the help of oxygen which forms a concentrated flame of high temperature. This flame directly strikes the weld area and melts the weld surface and filler material. The melted part of welding plates diffused in one another and create a weld joint after cooling. This welding method can be used to join most of common metals used in daily life.



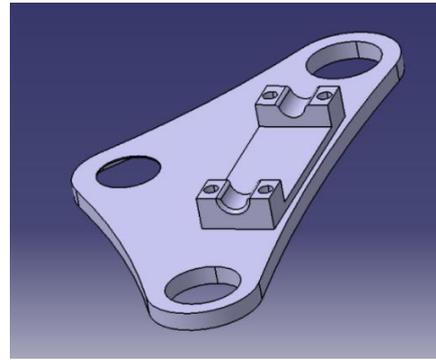
#### 5 DESIGNS

Design of chasis:-

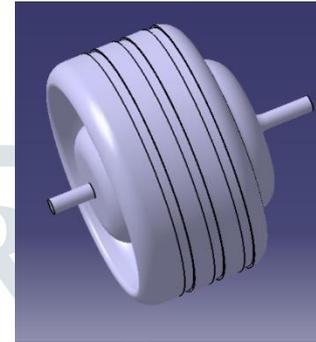
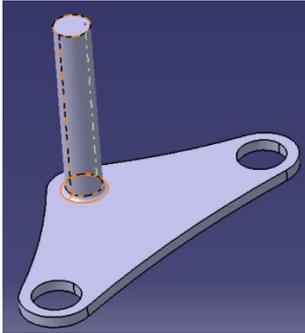
Design of upper yoke:-



**Design of Bottom Yoke:-**

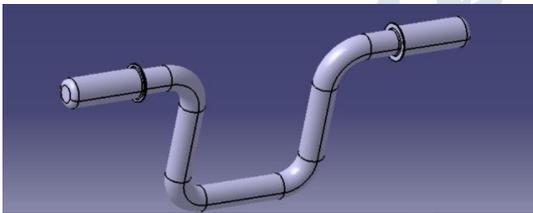


**Design of Wheel:-**



**DESIGN OF HANDLE BAR**

**FINAL ASSEMBLY OF FRONT PORTION**



**FINAL FABRICATED MODEL**



## 6 COST ESTIMATION

S.no	MATERIAL	COST(RS)
1	Chasis(Mild Steel)	700
2	Suspension Fork	1200
3	Upper yoke	500
4	Lower yoke	400
5	Handle bar	280
6	Brakes	600
7	Fork oil	180
8	Electric hub wheel, Throtle	6500
9	Motor regulators(48v,12v)	2500
10	Wheel chair	4500
11	4 batteries(12V, 26AH	13500
12	Electric accsseroies	1200
13	Horn, Head light, switches	1050
14	Labour	3000
<b>Total cost</b>		<b>35,510</b>

## 7 ADVANTAGES AND DIS ADVANTAGES

### ADVANTAGES: -

- Renewable energy
- Low cost compared to other hybrid wheel chairs
- Simple to use for physically handicapped persons
- No emission

### Dis advantage: -

- Speed limited
- Only for Physically disabled persons
- Time to charge batteries

## 8 CONSLUSION

Wheel chair automator are defiantly environmentally friendly and highly useful for physical handicapped people. Batteries have a long life. So, can be used for more times. Research on modification is going on such as portable, batteries... etc. This make Helpless people don't try to seek help for travelling.

## 9 ACKNOWLEDGEMENTS

First and Foremost, I would like to thank my guide, **SATHISH KUMAR V S** assistant professor, department of mechanical engineering, MTIET, palamaner. For his Ideas and Feedbacks during of this project. Without his guidance and support, this could not be completed on time.

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## 10 REFERENCES

- [1] <http://www.bicycleman.com/>
- [2] <http://www.berkelbike.com/>
- [3] <https://www.lincolnelectric.com/en-us/support/process-and-theory/pages/arc-welding-detail.aspx>