IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Fabrication of Quad Cycle For Handicapped Person

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Abstract: Our project involves simple design of motorized handle attachment mechanism for manual wheelchair for better mobility on road. The hand bike consists of electric Hub motor, rechargeable battery, a controller electric throttle, and mechanical brakes. The design is simple, and is affordable for middle class peoples. The mechanism is designed to be safe, light weight and aesthetic look. This electric motorized handle attachment can be easily detachable from wheelchair. This explains how an electric hand bike is made within limited budget for handicapped people.

***K*EYWORDS :- Chair, BLDC Hub motor, PWM circuit, Mild steel frame, Rechargeable battery.**

1. INTRODUCTION

Handicapped person who use manual wheelchair and drive it by manual force of his arm, these wheelchairs also provide physical fitness to the shoulder due to repetitive use. But by the use of such manual wheelchair for long time these people also often experience shoulder pain due to steering wheel chair with only the upper limb muscles for a long time. Some disable peoples need medical treatment and also have surgical treatment in serious case.

To avoid such shoulder pain we have designed a wheelchair attachable mechanism by using electric BLDC Hub motor and its controller we can make manual wheelchair mobile

This wheelchair can be used to go near places around the disabled person's home our wheelchair will completely reduce efforts to drive wheelchair

2. COMPONENTS

2.1 Brushless DC Motor or hub motor

It is also known as a hub motor or a BLDC motor. They are typically brushless motors and contains a number of separate coils and

an electronic circuit. The circuits switch the power ON and OFF in the coils and this creates force in each of them, thus making the motor spin. The electric motor is powered by a rechargeable lithium ion battery.

Brushless DC motor (BLDC) motor use a rotating permanent magnet is soft magnet core in the rotor, stationary electrical magnet on the housing. The main benefits of BLDC motor drive have long life span little maintenance, good efficiency. But, the initial cost of this motor is high

2.2 Motor Controller

The electric vehicle controller is the electronics package that operates between the batteries and the motor to control the electric vehicle‘s speed and acceleration much like a carburettor does in a gasoline-powered vehicle. The controller transforms the battery’s direct current into alternating current (for AC motors only) and regulates the energy flow from the battery. Unlike the carburetor, the controller will also reverse the motor rotation (so the vehicle can go in reverse), and convert the motor to a generator (so that the kinetic energy of motion can be used to recharge the battery when the brake is applied). Modern controllers adjust speed and acceleration by an electronic process called pulse width modulation. Switching devices such as silicone-controlled rectifiers rapidly interrupt (turn on and turn off) the electricity flow to the motor. High power (high speed and/or acceleration) is achieved when the intervals (when the current is turned off) are short. Low power (low speed and/or acceleration) occurs when the intervals are longer.

2.3 Electric Throttle and Brake

The electric throttle has three connections – a 5V supply, a ground wire and an analog output which varies depending upon the degree to which the throttle is rotated. The first and the second connections are given from the motor controller while the analog output is

connected to the analog input of the microcontroller. The analog output varies from 1V to 4V. The mechanical brake is fixed to the hub

motor.

2.4 Components

Figure 1: Components

3.CIRCUIT DIAGRAM

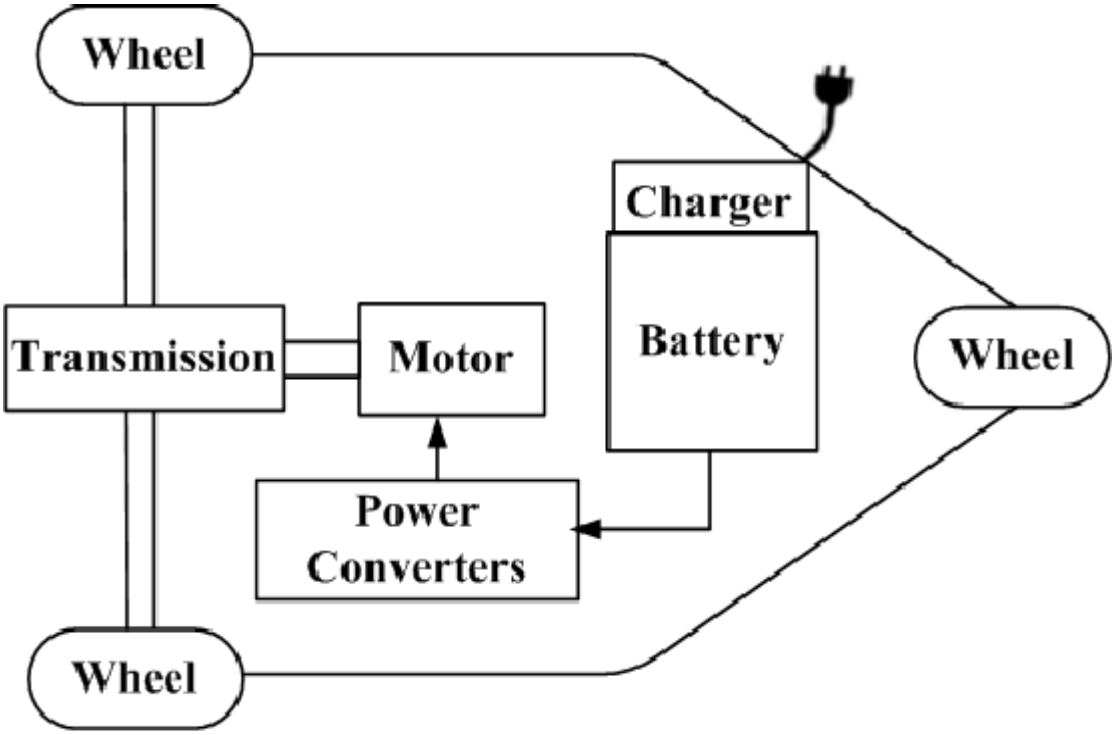

Figure.2: circuit diagram

4.MATHEMATICAL CALCULATION:

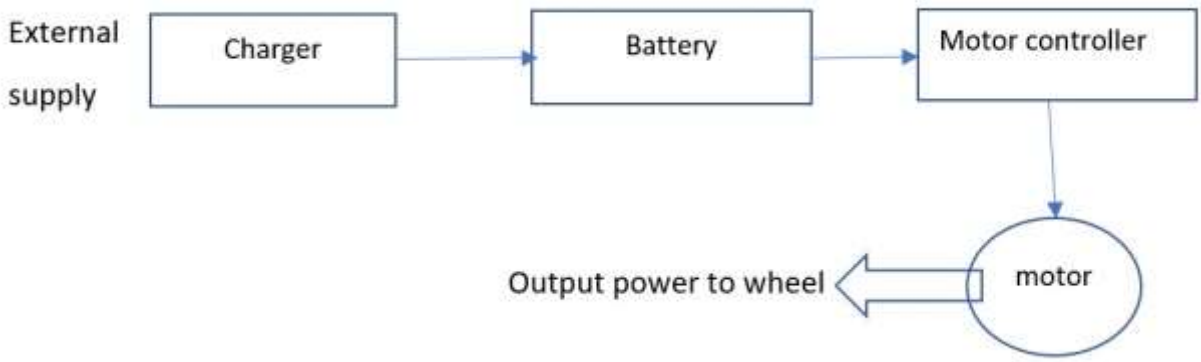

Figure.3: block diagram of power transmission flow

Weight of wheelchair with person =100Kg

Efficiency mechanical efficiency=85%

Wheel radius=0.2m

Speed=10Kmlinear distance travelled =1πr

= 1 x 3.14 x 0.2=0.628m

1] Speed=10Km/Hr.

Speed= (10x 1000)/3600

=2.78m/s

2] RPM

RPM= (Total distance covered per hour)/ (Linear distance)

=10000/628 x 60

=955.414 RPM

3] Power

P= (m x g x v x rolling resistance) +(air density x coefficient of drag x area x v^3)

P= (100 x 9.81 x 2.78 x 0.00) +(1.225+1.8 x 0.30+2.78^3)

P=23.25KW

4] Torque

η=85%

η=(Poutput/Pinput)

Pinput =23.25

For the illustration of selection of power rating for a Motorized wheelchair of 100 kg, a motor with output power rating of 200W has to be selected. In this way, power rating required to drive an electric vehicle of particular load is calculated

The power required for the traction is delivered by the electric motor in a motorized wheelchair and it is of different types. Therefore, selecting an appropriate motor is also equally important. We have selected BLDC Hub motor for our project.

5.MODEL OF PROJECT

Figure .4: Front view of handle mechanism

5. FUTURE SCOPE

- We can use solar energy by installing roofs of solar panel to charge battery
- we can use shock absorber for comfort.
- These Quad cycle are designed to offer mobility solutions to individuals with disabilities and their future developments.
- We can use solar energy by installing roofs of solar panel to charge battery and we can use shock absorber for comfort working on reviews and feedbacks can help to improve the current issues for quad cycle for handicapped and also new ideas can be imagined on that project.

6. CONCLUSION & RESULT

- The development of the quad cycle for handicapped individuals represents a significant leap in assistive mobility technology. This project meticulously navigates through stages of design, material selection, manufacturing, and rigorous testing to ensure a product that is safe, durable, and user-friendly.
- The quad cycle's ergonomic design, robust safety features, and reliable performance address the specific needs of handicapped users, enhancing their mobility and independence.
- This innovation not only improves the quality of life for its users but also sets a new standard in the design of mobility aids. In our project we utilized single slider mechanisms for operating tricycle hence it is most useful and economical as compared to the other tricycle. This tricycle is made of material which is available easily in market.
- This tricycle is mostly useful for elder and handicapped people. It is simple in design and easy to operate. The study of wheelchair design calculation, includes aspects such as weight of user, battery capacity, material for frame.
- Motor required for this wheelchair of 250W capacity, Battery is of 48V and Controller required is of 48V.

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