IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Motorized Handle Attachment Mechanism for Wheelchair

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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.

Index Terms **– Mobile wheelchair, BLDC Hub motor, 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.

2.2 Motor Controller

The main purpose of the motor controller includes hall sensor communication, motor speed measurement, PWM output to the motor, protection from over-voltage, over current and thermal protection.

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.

3.CIRCUIT DIAGRAM

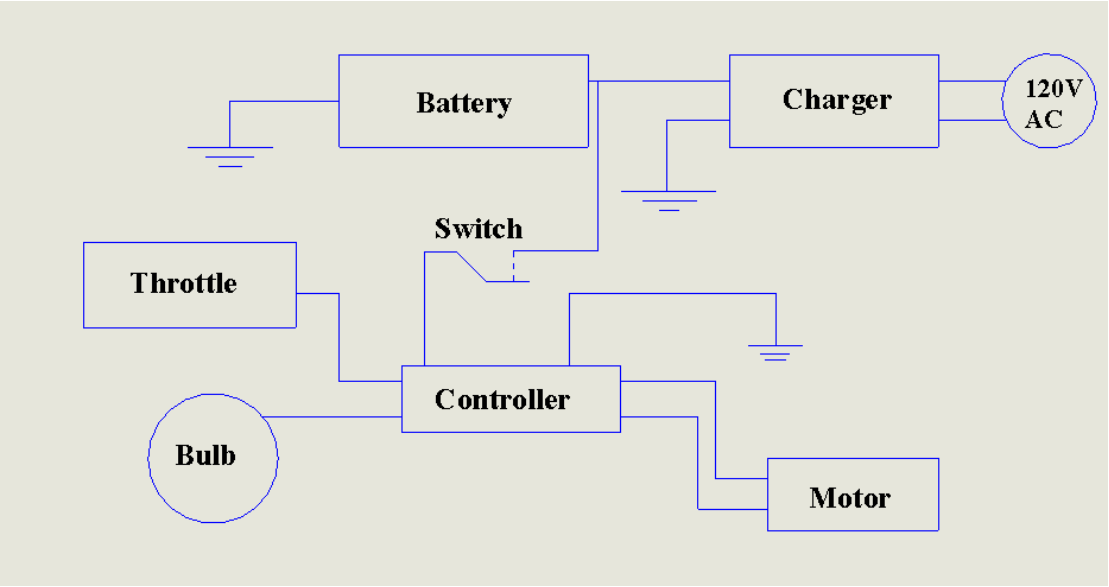

Figure.1: circuit diagram

4.MATHEMATICAL CALCULATION:

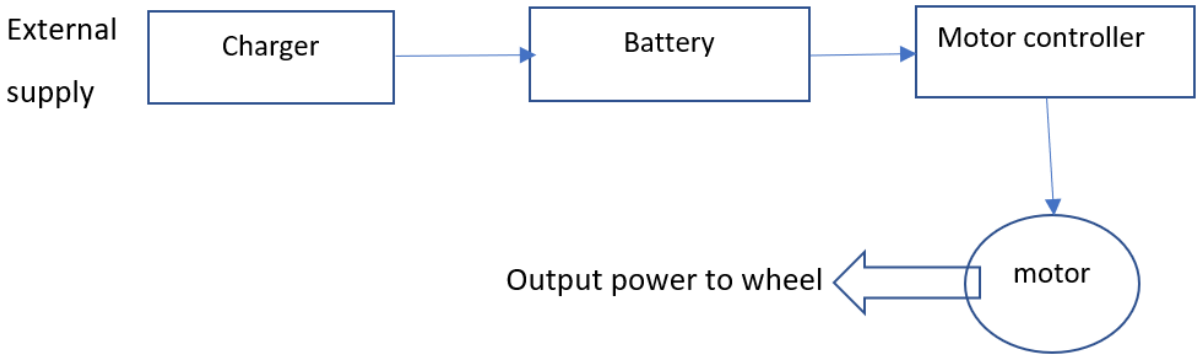

Figure.2: block diagram of power transmission flow

Weight of wheelchair with person =130Kg
Efficiency mechanical efficiency=85%
Wheel radius=0.2m
Speed=20Kmlinear distance travelled =2πr
= 2 x 3.14 x 0.2=1.256m

1] Speed=20Km/Hr.
Speed= (20 x 1000)/3600
=5.56

2] RPM
RPM= (Total distance covered per hour)/ (Linear distance)
=20000/1256 x 60

3]Power
P= (m x g x v x rolling resistance) +(air density x coefficient of drag x area x v^3)
P= (130 x 9.81 x 5.56 x 0.00) +(1.225+1.8 x 0.30+5.56^3)
P=163.330)

4]Torque =
η=85%
$\eta=(P_{output}/P_{input})$
Pinput=163.33

5]Power output=η x P_{input}
T x ω =0.85 x 163.33+
ω= (2πN/60) = (2 x 3.14 x 265.392)/60
ω=27.79
τ= (0.85 X 163.33)/27.79
τ=4.99Nm

For the illustration of selection of power rating for a Motorized wheelchair of 130 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.

OR

Here we have another method to calculate torque

1Nm=10kg
There for 130kg=13Nm
We have,
Radius of wheel=0.20m
We will calculate Force and then put into equation of Torque

Force=m x a

Here a=v/t
=5.56/15
=0.3706m/s^2

∴ F =130 x 0.3706
F=48.186

Torque is

τ =Radius x Force
τ=0.2 x 48.1867
τ=9.637Nm

5.MODEL OF PROJECT

Figure.3: Side view of model

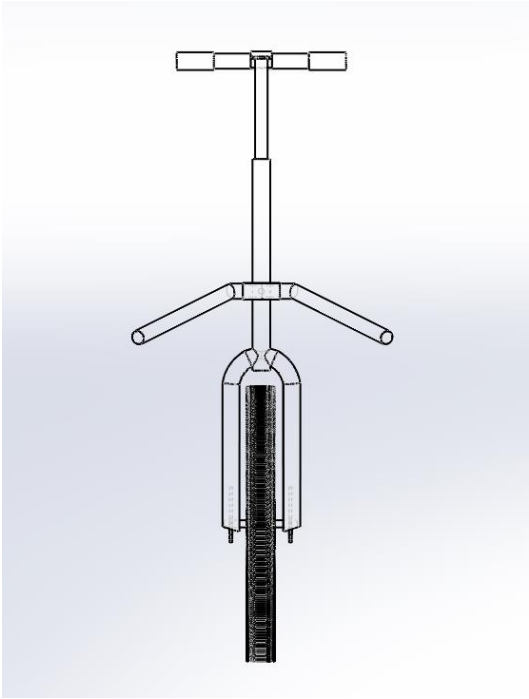

Figure .4: Front view of handle mechanism

FUTURE SCOPE

- We can use solar energy by installing roofs of solar panel to charge battery
- we can use shock absorber for comfort.

CONCLUSION & RESULT

- The research paper is reviewed for design and ergonomics aspects of motorized handle attachment wheelchair the research paper focused on selection of various wheelchair parts used to convert normal wheelchair into powered ones which do not need humans to apply force to propagate.
- 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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