

Design and fabrication of three wheel electric vehicle

Vijaya Musale¹, Krupali Mulmule², Trivenee Dhawle³, Dipali Randive⁴,

Sainath Chavan⁵, Vaibhav Ambatkar⁶, Dr.D M. Holey⁷

¹(Electrical engineering,KDKCE/RTMNU, India)

²(Electrical engineering,KDKCE/RTMNU, India)

³(Electrical engineering,KDKCE/RTMNU, India)

⁴(Electrical engineering,KDKCE/RTMNU, India)

⁵(Electrical engineering,KDKCE/RTMNU, India)

⁶(Electrical engineering,KDKCE/RTMNU, India)

⁷(Prof ofElectrical engineering,KDKCE/RTMNU, India)

Abstract -The three wheel electric vehicle has been built a part of applied control and electrical and mechanical fusion. It is a three wheel self balancing as well as manually balancing electric vehicle. This is one of the low speed transportation device that can be used for small distance. This eco-friendly and energy efficient vehicle due to regenerative braking that carry maximum weight upto 70-80kg. The construction of this vehicle is to reduce the problem of lack of stability, affordable vehicle at minimum cost. In this vehicle the third wheel is used for self balancing. It's size is small so require less space for parking.

KeyWords: Fail safe ,Iron chassis, Wheel, DC motor, Battery, Microcontroller, etc.

1.INTRODUCTION

The transportation sector of today always been an enigma for the various government. The rise in the number of vehicles on the road as the year pass by continue to increase exponentially over passing time, which leads to more pollution as well as on congestion on roads.[8]. There is so much innovation when it comes to the four or three wheeler market, as most of the are now electric and comes with lots of different features when it comes to the human safety. In other hand because of lack of innovation in manufacturing to the two wheel motorcycle we are still lacking behind when it comes to rider safety.[9]. So to reduce this human efforts, we here proposed a three wheel electric vehicle for it. The product varieties in different shapes and different packing of good for loading and unloading has always been a heavy process during transportation by vehicle were naturally inverted and became the solution to this problem they save time and space.[11]. In developing country

like India where high income group people is less in number if it is available for low cost it will be preferred by all.[12].

2. Fabrication of vehicle

1. **Arduino board:-** The Arduino is a microcontroller board base on ATMEGA328. It has 14 digital input and output pin, 6 analog input, a usb connection, a power jack and reset button. It contain everything needed to support the microcontroller.
2. **Dc motor:-** Motor is fixed with the chassis through screwed board and it is the main source of the power to drive the vehicle. There are two motors, each for one wheel. The motors are driven by two 12v batteries arrange in series. The maximum torque provided by the motor is 16Nm approximately.
3. **Battery:-** The VRLA battery (valve regulated lead acid battery), more commonly known as a sealed battery or maintenance free battery, is a type of lead acid rechargeable battery. Due to their construction they can be mount in any orientation and do not required constant maintenance.
4. **Drive wheels:-** The maximum speed of the three wheeled electric vehicle is limited to around 7km/hr so the radius of the drive wheel around 3cm for a typical 60-70 rpm drive motor. As this vehicle has designed to carry a user weighing 70kg and some suspension the types would help smooth the ride for and a large mass. Aesthetic consideration required in the radius of the wheels to be atleast 3cm. typical pneumatic tyres with good suspension that are designed to take 90kg load each comfortably work good for the three wheeled electric vehicles. However mass of the types are rated with speed rating and load index, which can be helpful in selecting the tyres base on the speed and load requirements.

Subsystem design and implementation

1.Handlebar:-

- The handle bar is attached to the chassis and serves as a support for the rider.
- Handles for tools and are an important part of their functions, enabling the user to exploit the tools to the maximum effect.

2. Gear box:-

- The Gearbox consists of metal gears with the ratio of 30:40.
- It is used to increase the rpm of motor.

3.Chassis:-

- The chassis is designed to provide the rider with a safe and robust standing platform and to protect the electrical system and component.
- The top plate of the chassis is easy to detach and the space inside is big enough to allow easy servicing to components.

Chassis stress calculation

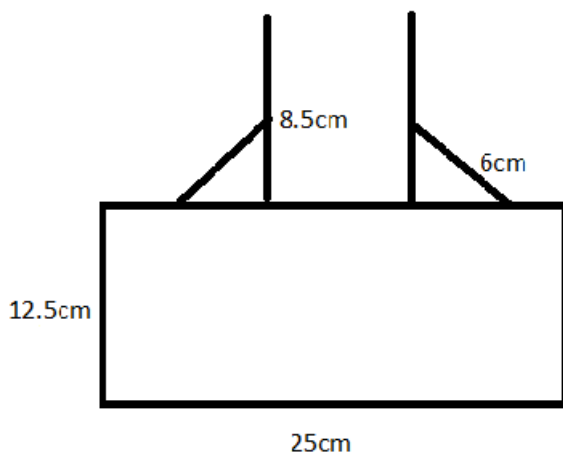


Fig2.1:- Construction of chassis.

Stress= resisting force per unit area or load per area.

The weight acting on vehicle = weight of vehicle +weight of user

$$=20+70$$

$$=90 \text{ kg}$$

$$\text{Load acting on vehicle} = 90 \times 9.81$$

$$=882.9\text{N}$$

$$\text{Area of vehicle chassis} = 317.5 \times 635\text{mm}$$

$$=201612.5\text{mm}^2$$

Stress acting on the frame or chassis of the vehicle

$$=882.9/201612.5$$

$$=4.3791 \times 10^{-3} \text{MN}$$

3. Fabrication of PCB

The following basic step PCB as follows:-

- Set-up
- Imaging
- Etching
- Drilling
- Masking
- Silk screening
- Route
- Electrical test

4. Regenerative braking

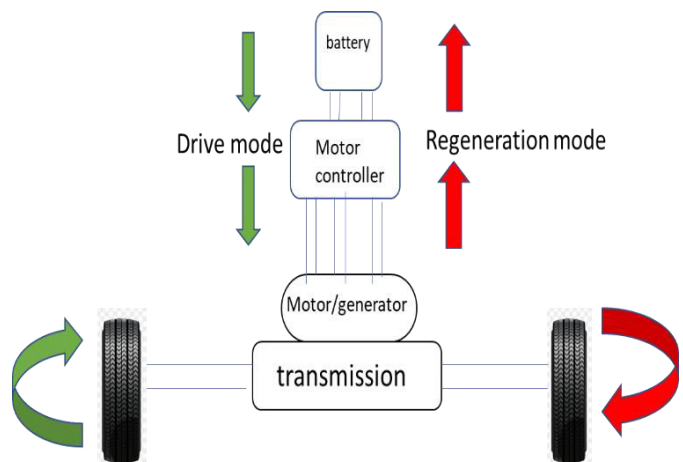


Fig4.1:- Regenerative braking.

Regenerative braking is an energy recovery mechanism that slows down a moving vehicle or object by converting its kinetic energy into a form that can be either used immediately or stored until needed. This braking is carried out on two parallel motors and it is preferable identical ones without wasting their output as shown in fig 4.1. The two motors are coupled mechanically and adjusted electrically. That are used as a motor and generator. The mechanical output of the motor drives the generator and the electrical output of the generator is used in supplying the greater part of input to motor.[13]. If in this motor there is no losses then without any external supply the motor would have run. If we have to stop the motor then it is necessary to interchange the connection of motor then the motor is act as generator then generating energy can stored in battery.

5. Conclusions

[14] www.carbikrtech.com.

In this project we have design the transporter with the more efficient use of energy and providing the eco-friendly artifice by using relevant concepts. This project was and to find an effective solution to transportation problem. The main objective is to achieve space utilize and minimize the fuel consumption the advantages of the design for application as a safe and green personal transport.

REFERENCES

- [1] Mr.Velaji Hadiya, Mr. Akash Rai, Mr.Sushant Sharma, Miss. Ashwini More,"Design and Development of Segway", IRJET, Volume:03, Issue:05,May-2016.
- [2] Mr. Mayank Sharma, Rahul sharma, Kshitij Singh,Vikrant Sinha, Shakil Tadavi,"Segway-The Human Transporter ",IJIRST, Volume1,Issue11, April 2015.
- [3] B. Harshavardhan Reddy ,G Ravi Teja Reddy , G Suresh ,MVinodh Kumar Reddy, N. Prassana Kumar, B.Venu,"Design and Fabrication of Fail Safe Segway ",IOSR-JMCE,Volume 12, Issue 3. [4] J.B.Gupta, Theory and Performance of electrical Machines, 14th edition ,SK Kataria and Sons,2010
- [5] M.V.Kothari, Design and Testing of Electrical machine.
- [6] Ankit S. Khanzode, Ashish G. Masne, Mohd.Shahzad Gulam Ali, Akshay P.Tale,Kamalkishore G Maniyar,"Mechanical Segway",IJETR, Volume-4,Issue-3,March 2016.
- [7] Prof.Yogesh Risodkar, Mr.Ganesh Shirsath, Ms.Monali Holkar, Mr.Mayur Amle,"Designing the Self- Balancing Platform(Segway)",IJETR, Volume 4, Issue 9, September 2015.
- [8] Infanta Mary Priya.I, B.K. Vinaygam, M.R.Stalin John",jcphs.
- [9] Prashant Gowardhan, Akhilesh Thakre, Nehal Shende, Nachiket Phadnis, Sudarshan Muley,"Survey on Self Balancing two wheel electric Prototype",IJERGS, Volume 5,Issue 5, sep 2017.
- [10]Eng.Wael Younis*Prof.Dr.Mohammed Abdelati*,"Design and Implementation of an Experimental Segway Model",proceeding of the 2nd Mediterranean Conference on Intelligent System And Automation, March 2009.Zarzaris,Tunisia.
- [11] Siddhart Varhadi, Neha Dhere, Prof. Priyanka Verma, Atul Ghorpade, Jayesh Shinde, Prof.Suraj Marale,"A Review Paper on Segway Forklift",IJERT,Volume 8 Issue 01,Jan 2019.
- [12] Pratik M Chavan, Mr.D.P.Patil, Dr.Madhukar S.Chavan,"Design and Implementation of Low Cost Segwaythe Human Transporter",IJRASET,Volume 5 Issue IV, April 2017.
- [13] A Textbook of Electrical Technology,"AC and DC Machines volume 2",by B.L.Theraja.