

Development of Single Wheeled Electric Bike

^[1] Shreyas.G.U, ^[2] Dr.C.J.Gangadhar gowda, ^[3] Dr.N.L.Murali Krishna

^[1] UG Student, ^[2] Professor, ^[3] Associate Professor

^{[1][2][3]} Department of Mechanical Engineering, P.E.S. College of Engineering, Mandya

Abstract: -- Single wheeled electric vehicle includes DC electric hub motor and a steering mechanism, where in this system is disposed within the wheel of the single wheeled vehicle. The wheel has a hub motor within which there is a stationary centre shaft and vehicle is provided with small training wheels and operation of the motor causes the rotation of the wheeled vehicle depending upon the throttle. This paper describes the development of Single Wheeled DC Electric Vehicle which can be driven with the help of an accelerator and a power controller. In the present study an indigenously built Prototype generally relates an electric transportation and more particularly relates to Eco-Friendly Single-wheeled vehicle which can be used in both indoor and outdoor systems as a mode of transportation.

K Index Terms— Single Wheel, Electric Hub motor, Electric Accelerator, Power Controller, and Brake Drum.

I.INTRODUCTION

The desire for new forms of transportation and an Eco-Friendly vehicles are on going pursuit of Modern man, Personal transportation vehicles such as scooters, motor cycles, cars have known levels of user excitement while riding, there are different types of driving mechanisms for electric vehicles and the hub motors are developed to improve the shortcomings of the conventional driving mechanism which require long transmission system.

Generally, an Electric powered Single Wheeled Electric bike includes a drive system and a braking system disposing within the one wheel, and further it includes handle bars and a steering linkage from the handle bars to the wheel forks.

The hub motor of the present development is to comprise a small in size, compact motor assembly which is to be mounted in conjunction with the hub of the single wheel. The motor assembly comprises a self-contained unit which includes a rotationally driven motor housing that is connected directly to the tire supporting rim, Rotation of the motor housing will result in similar rotation of the outer wheel. The motor housing has an internal chamber and within that internal chamber is located a stator and a rotor. The stator is fixedly mounted onto a centre shaft which passes through the motor housing. The rotor is to be rotated by the electrical energy being supplied to the stator with this rotation being transferred through the drive shaft to a driven wheel.

Since major systems are housed within the wheel

itself, many core components of a traditional automobile can be removed such as the engine, transmission, clutch, suspension and other related parts because the in-wheel components handle all of these functions. This replacement of mechanical functions with electrical functions can be used as by-wire technology. For example: The motor reduces carbon emissions and addresses the rising demand for more environmentally sound vehicles such as EVs.

Certain aspects to the present development relate to a body structure [5], This body structure connects each of the sub system and houses the battery and a power controller, such a body may be fabricated from a variety of materials, It is desirable that the material(s) used to fabricate the body structure have the characteristics of being strong, light weight and easy to manufacture.

2. BRIEF DESCRIPTION OF THE FABRICATION

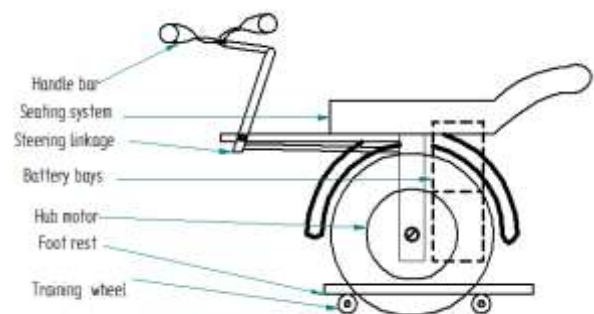


Fig.1 Schematic representation of Single wheeled Electric Bike.

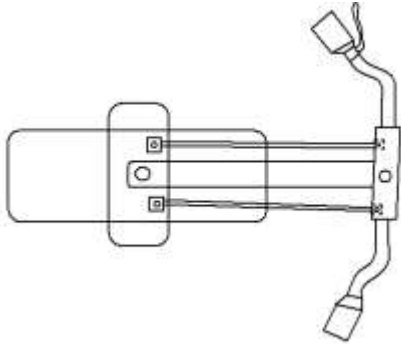


Fig.2 Top view of Single Wheeled Electric Bike.

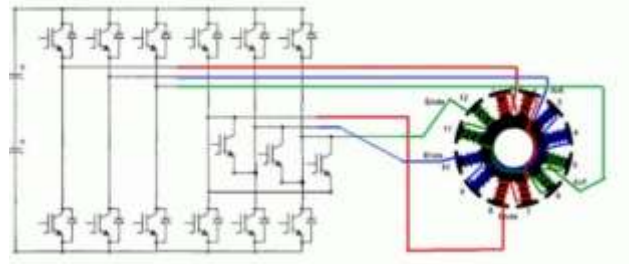


Fig.5 Wiring Diagram of Motor and Controller connections.

(Ref. Electric motor and controller connections Electricbike.com)



Fig.3 Electric DC Hub Motor.

(Ref. Electricbike.com)



Fig.6 Schematic representation of a DC Hub Motor with two side coverings.

(Ref. Electricbike.com)



Fig.4 48v Electric controller with all the terminal ends.

(Ref. Electricbike.com)



Fig.7 Assembled view of Single wheeled electric bike (Prototype).

For a better understanding of the present development, reference is to be made to the accompanying drawings. There could be utilized alternate embodiments of the present development which are not shown in the accompanying drawings but are believed to still fall within the scope of this development. It is to be understood the development is not limited to the precise arrangement shown in the drawings.

Inside the wheel there is the main drive[3], it includes an electric hub motor, the wheel hub has a ball bearing pressed into it and slipped over the shaft, the field of this invention relates to be used in conjunction with a single wheel and more particularly to a compact, small in size, Powerful electric motor has an internal sensor which is mounted at the hub of the wheel which is being driven , Electric motors have been used in the past to operate bicycles/cars electrically .The electric motors of the prior art have been rather large in size and are relatively heavy weight .It is desirable to have the electric hub motor to be as small as possible and also have the batteries to be as light in weight as possible to thereby keep the overall weight of the vehicle as low as possible.

Electric motor [8] requires the use of an electronic controller which controls the different speeds that the motor is being operated, this requires an additional housing structure.

The electronic controller [4] can control the charging of a rechargeable battery. The electronic controller can be coupled to a motor controller or a brake controller, the electronic controller also receives commands from a rider to receive speed and travel direction control. The sensors can be an encoder such as a linear sensor, a capacitive sensor, a Hall – effect encoder or an LED based sensor. The centre shaft includes a cut-out in which the cable is to be passed through the cut-out and to be located within the internal chamber of the motor housing. The cable comprises a plurality of electrical conducting wires which are connected to the electronic components such as printed

circuit boards, it is then fixedly mounted on a mounting plate and it is made up of conducting material like aluminium and is basically disc shaped and is fixedly attached by means of a set of screw.

The drive shaft is capable of being rotated about rotational axis, it is to be noted that the rotational axis is located parallel to the longitudinal centre axis. The locating of the axes and parallel provides for smoother operation of the motor. The end of the drive shaft includes a spline connection, the spline connection connects with rotor bushing, it is a securely mounted onto a cup shaped member which is defined as a rotor , mounted interiorly of the rotor are a series of magnets, these magnets are to be located directly adjacent but slightly spaced from a series of radially located coils, there are multiple number of the coils each of which comprise electrically conductive wires that are wound about a series of radially disposed spoke called stator laminations. The coils are connected by leads to the printed circuit board.

The operation of the present assembly is as follows: When the rider wishes to drive the vehicle by means of electrical power, the user is to manually switch on the key from off position to the on position. This will result in electrical power from the battery being supplied through the cable to the printed circuit board and then through lead wires to the coils and the magnets. This rotation of the rotor will cause the rotor bushing to rotate which rotates the drive shaft, the rotation of the drive shaft will cause the rotation of the driven wheel.

3. TECHNICAL SPECIFICATIONS

PARAMETERS	CONTENTS
Max loading	140 kgs
Max speed	35-45 Kmph

Motor power	750 watt
Battery type	Dry battery
Battery capacity	48v, 24Ah
Charger	AC 220v, 50Hz
Charging time required	6-8 Hrs.
Running distance per charge	40-45 Kmph
Weight without battery	30 kg
Battery weight	28 kg
Wheel ability(upward inclination)	40 degree
Wheel size	17 inch
Head and tail lights	LED

CONCLUSION

The present development Single wheeled electric bike is an eco -friendly vehicle in particular both economical and with less maintenance cost and good efficiency(35- 40km per full charge) ,due to increase in the rate of air pollution and increase in the toxic gas level by the automobiles and increase in the cost of fossil fuels like petrol and diesel and rapid increase in the growth of vehicles on road in all the Metropolitan and Suburban cities day by day one can prefer this electric vehicle for fun, entertainment riding, mode of transportation and day to day life usage.

Though from the 1860's through to the 1930's they were proposed for use as serious transportation, Unlike multi

wheeled vehicles much more skill is required to balance and steer the Single Wheel Bike.

Further developments can be done by implementing TFT display as a speedometer and for the battery percentage display, GPS and Navigation systems , APP connectivity(to transfer all the details about vehicle condition), water resistant.

Main features of this development:

- 1) No fuel
- 2) Sound less
- 3) Gear less
- 4) Eco-friendly

Few applications of this electric bike:

This vehicle can be used in all Metropolitan and suburban cities as a mode of transportation in both indoor and outdoor (with suitable road conditions)systems like Airports, Railway stations, University campus, School premises, Hospital premises, Shopping malls, Industry premises, Historical and tourist spots, Sports and recreation centres.

REFERENCES

- [1] United States Patent Hoffmann et al, US 8,800,697 B2 Aug, 12, 2014
- [2] "The Uno Electric Motorcycle or Motor Unicycle" .Matt Embrey.Green Upgrader website. May 8, 2008. Retrieved 2 Jan 2009
- [3] Professor Klaus Hofer from University of applied sciences in Bielefeld, Germany, "Electric vehicle on one wheel", research paper published by vehicle power and propulsion, pp,517-521.
- [4] Huang et al, "The Development of Self balancing controller for one -Wheeled vehicle", article published online at <http://www.scirp.org/journal/eng/by> Scientific

Research, Apr.2010, pp.212-219.

[5] Author Unknown, one wheeled-motorcycle, photograph, circa before Aug.31.2009

[6] US7108090 5 Nov 2002 Assembled Products Corporation “Motorized cart with hub gear motor system”.

[7] US8348798 29 Jun 2011 Chiu-Hsiang Lo “Hub motor for electric vehicles”.

[8] EP2423094A2 12 Aug 2011 Chiu-Hsiang Lo “Electric wheel for electric vehicles”.

