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E-BIKE

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ABSTRACT

The electric bicycle is an electrical-assisted device that is designed to deliver the electromagnetic momentums to a present bicycle therefore relieving the user of producing the energy essential to run the bicycle. It contains a strong motor and enough battery power that just needs charging to help in hill climbing, generate greater motoring speeds and provide completely free electric transportation.

Now-a-days there are so many vehicles on road, which consumes more fuel and also hazards our environment. It is our responsibility to reduce the consumption of fuel and its hazardous emission products. Taking this into consideration it is our small step towards reducing the use of more fuel consuming vehicles and attracts the eye of people towards its alternatives i.e., Electric bike. So, we intend to design a bike which would run on an alternative source and also reducing human efforts called as Battery Operated bike. In this project we design an alternative mode of transport for betterment of social and environment

Keywords: e-bike, electromagnetic momentums.

1. INTRODUCTION

In transportation we have developed quite a lot by the range of hi-tech vehicles we have, still the importance of bicycle cannot be neglected. Bicycle is popular in all groups because it is easy to handle by its light weight, and do not cost money to operate as it does not require fuel to run, still very efficient in small distant traveling. It has many distinct qualities, which make it even special over other vehicles, like they do not require registration fees, insurance, or driving license. Similarly, it has less prone to heavy casualties, thereby making it a safer transportation. Besides it has health benefits, just the same way as in any physical exercises.Similar to this, e-bike on the other hand is a modified version of the same. In e-bikes the difference comes by the application of the motor system, use of the controller to control the motor system, and also with battery to Power it. The motor is used in order to give external power to make the ride comfortable. E-bike is better than the normal bike because rider can get additional power when it is required, if it is used like that. In this the rider has the choice when he is less of power and unable to drive forward easily, usually when there appears an uphill or strenuous long road, he can switch on the battery, and thereby activates the motor. Then motor compensates the required power and this way ride becomes smoother all the way. It is up to the rider as when he wants to switch on the power. He can choose motor to propel all the way for his support, or use it when he actually needs. There are again various levels which the rider can choose depending upon the condition of the road, and the amount of speed that is desired in riding. Similarly, there is throttle to make riding adjustable, either compensating speed for less strain, or get speed for high strain, this is absolutely on the choice of the riders' strength and selection. When we try to address the best feature of e-bike, then we can say that as there is almost no strain while riding e-bike that we notice in normal bike driving uphill, therefore it is easy to sum up that when there is less strain, rider can travel a long distance very easily, there is also less perspiration making user tidier again, giving possibilities for wide range users.

2. LITERATURE REVIEW

The German Naturalistic Cycling Study – Comparing cycling speed of riders of different ebikes and conventional bicycles [1] Objective of this paper to was to explore the acceleration and speed of orthodox and electrically powered bicycles under truthful statuses. Authors distinguished between electric bicycles which deliver provision up to 45 km/h (as known as S-pedelecs) and 25 km/h (speed of pedelecs). Additionally, as speed limits of 30 km/h might influence especially on the execution of speedier cyclists (e.g. Spedelec rider), the potential mean speed might be even advanced under various situations. Authors also found noteworthy variances in numerous measures between pedelecs and orthodox bicycles, although less noticeable. This might interpret as a symptom that, when accelerating from standstill, the assistance provided from motor used by the pedelec riders to reach their preferred speed easier, not earlier. Authors also given the variance in the user population, it is not irrational to admit that at present, e-bikes do not cause any revolution in cycling mean speed at all. The growth of e-bikes in younger cyclists is still there. It has even been embraced that the e-bicycle is going from being a "recovery vehicle" to a stylish frill. By these authors gave the vision that this will change two wheeled activity and street security in the center and long stretch. Urban Electric Bike [2] In this paper, authors considered importance of easy vehicle mobility and compactness. In which they revealed that folding is the strategic feature of the ebike which would not have been probable devoid of the folding arms. For the ease of sliding of the arms a bolt is provided. In order to provide rigidity to the bike a guide has been provided on the main frame.

About other components, both the plates are welded on front arm of the bike and a constraint is established on the back arm to confine the angle between the two arms to 50°. Furthermore, in paper the specifications and functionalities regarding components of e-bike were discussed. At initially, fundamental driving component about Hub Motor that Regular electric motors utilize a mechanical gadget called a commutator and two contacts named carbon brushes to switch the electric current periodically and affirm the pivot continues handing over the comparative bearing. Hub motors are characteristically brushless motors which replaces the commutator and brushes with planetary gears and an electronic circuit.Then about the accelerator or say throttle, author discussed below working. Working of a Twist throttle is based on the principle of potentiometer which is also called variable resistor. It is used to fluctuate the voltage passing through the throttle. In order to pass more through the throttle, the more twist should be provided as a result less is the resistance. Therefore, twist throttle offers the signal to the BLDC hub motor controller to increase or decrease the current passed to the motor.

Campus Mobility for The Future: The Electric Bicycle [3] this paper presents the various outcomes and results of the study containing visions into the scheme. Electric bikes, of much sort have been surveyed by and by in a semi-open contract conspire on the Nanyang Technological University campus in Singapore. According to this campus, it is a famous and helpful administration, with a few models of electric bike being exceptionally very much utilized. Riders contemplate the premier of the electric bikes to be both agreeable and engaging while at the same time utilizing it, and extremely suitable for campus travel. Understudies and general society alike view the plan unhesitatingly, and creators have seen a lessening in the quantity of miles driven via auto inside the grounds for the dominant part of clients who are additionally drivers.

Design And Fabrication of Dual Chargeable Bicycle [4] In this paper, authors discussed about the crucial components and its experiments of e- bike, alternator and batteries. First, alternator which is an electromechanical device that transforms mechanical energy to electrical energy in the form of alternating current. The brushes of a DC generator carry a small fraction of the current, which carry the generator's whole output. A set of rectifiers (Diode Bridge) is essential to alter AC to DC. To provide direct current with low ripple, authors used a three-phase winding and the pole pieces of the rotor are shaped (claw-pole) to produce a waveform similar to a square wave as an alternative of a sinusoid. Author used alternator of Yamaha bike which workings are done at high RPM since authors' electric bicycle is restricted to low RPM so they changed the windings of alternator and upsurge e the drive ratio. Hence, it can function at low RPM.

Another important part is discussed is regarding batteries Electric bicycles industrialized in Switzerland in the late 1980s for the Tour de Sol solar vehicle race accompanied sunlight-based charging stations yet these were later settled on rooftops and associated in order to nourish into the electric mains. The bikes were then charged from the mains, as is normal at this point. Battery frameworks being used incorporate lead-corrosive, NiCd, NiMH and Li-ion batteries. Range is a key thought with electric bicycles, and is influenced by elements, for example, engine productivity, battery limit, effectiveness of the driving gadgets, optimal design, slopes and weight of the bicycle and rider. The scope of an electric bicycle is typically expressed as somewhere close to 7 km (tough on electric power only) to 70 km (minimum assistance) and is profoundly subject to regardless of whether the bicycle is tried on level streets or slopes. The vitality expenses of working electric bikes are little, however there can be noteworthy battery substitution costs. In lots of available preferences authors selected 2 lead acid batteries of 12 volt 5 amp because of its easy availability and low cost and connected in series to get an output of 24 volt. Overall experimented results of this paper are: Speed of 10-15 km/hr is achieved when battery is fully charged. When coming down the hill the charging can be achieved in 1hr. Driven mechanism wheel wear rapidly due to friction. **3. CALCULATIONS**

LOAD SPEED CALCULATION

Step 1:-

Number of teeth on smaller sprocket (motor) (t1) = 9

Number of teeth on larger sprocket (bike) (t2) = 18

Speed on smaller sprocket (motor) (N1) = 3300 rpm

By using reduction ratio (9.78), speed will be reduced to

338 rpm

Speed on larger sprocket (bike) (N2) = ?

Step 2 :-

Using speed ratio formulae,

$N_1t_1 = N_2t_2$

N2 = 169 rpm

Step 3:-

Diameter of wheel =650mm

Circumference of wheel =3.14*650

=2041mm

Step 4:-

Speed of vehicle = speed of wheel X circumference of Wheel

=169 X 2041

=344418075 mm/min

=344.41 m/min

=20665 m/hr

=20.66 Km/hr

REQUIRED POWER TO DRIVE BICYCLE

Step (1)

Total load act on bike is as follow

Normal weight of person =60 kg

=60*9.81

=588.6 N

Weight of bicycle = 100 kg

=100*9.81

=981 N

Other Miscellaneous load =5 Kg

=5*9.81

= 49.05 N

The total load = (588.6+981+49.04)

= 1618.64 N

Step (2)

To find reaction on each wheel, The above total load

which is divided equally on both wheel

Force (Ffw) =Force(Frw)

=681/2

=340.5N

Where reaction on rear and front wheel are as follows

Rfw=Rrw

=0.2*340.5

=68.1 N

Step (3)

To find torque on each wheel

Total torque=Tfw+Trw

To find Torque on Front Wheel

T1 = Rfw*(D÷2)

=68.1*[(65*10-2)/2]

=22.1325Nm

T1=T2=22.1325Nm

Total torque on wheel=44.265 Nm

Step(4)

To find power on motor = 391.69 watt

ADVANTAGES

• Easy to commute with low fatigue.

• Less maintenance cost.

• Normal Drag/Pedal is possible when power is not in use.

• Deployable batteries – can be taken inside house.

• Cost of the unit is very low.

• Easy to carry since it is portable.

• Less energy consumed.

• High efficiency can be obtained if inverter is used.

• If using solar panel, free utilization of energy can be done.

DISADVANTAGES

• High intensity of wind load.

• High centre of gravity.

• Cannot tolerate drastic changes in environment.

• Needs Periodic Monitoring.

4. EXPERIMENTAL SETUP

WORKING

The working of our project basically explain by using the five blocks as follows

a) Battery.
b) Motor Controller Circuitry.
c) Electric motor.
d) Chain and Sprocket.
e) Controller.

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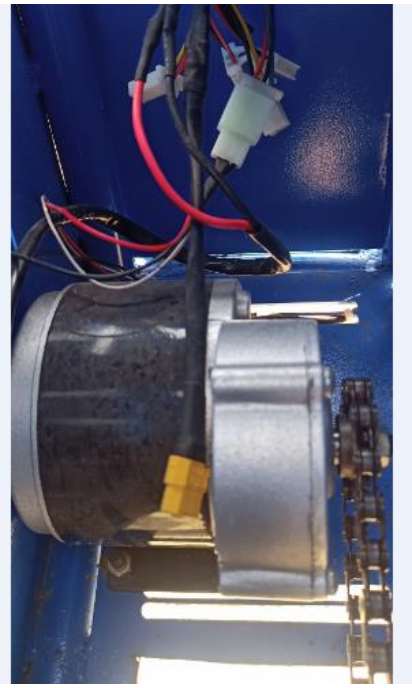
Parameter	Rating
Type of battery	VRLA - Valve-Regulated Lead-Acid Battery
Physical dimension (LxWxH) (mm)	167x126x176
Number of batteries	Four batteries connected in series
Voltage	12 V each, total 48 V
Amp-hour rating	26
Nominal voltage (V)	12
Weight (kg)	9 each
Recharging time - 0-90% (Hrs.)	8-10
Float voltage (V)	13.5
Boost voltage (V)	13.8

Motor

The motor is a conventional DC motor. The rotors outside the stator with the permanent magnets mounted on inside. The stator is mounted and fixed onto the axle and the hub will be made to rotate by alternating currents supplied through batteries. Hub motor generates high torque allow speed, which is highly efficient and which doesn't need sprockets, brackets and drive chains. This means they are very reliable and have a long life. The main characteristic of Brushless DC Machines is that they may be controlled to give wide constant power speed ranges.



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The controller is used to controlmotor voltage and change voltage rating with the time to provide the motor. Motor controller changevoltage DC to AC.

The controller is a multi-functional device and the brain of our . It provides signal to all major electronics components like accelerator, dIsplay panel, brakes, etc.

It activates when it receives voltage from the battery and supplies power from to the motor on receiving accelerator signal. Low voltage cutoff monitor the battery volt and shut down the motor if the battery voltage is too low that time protects the battery from over discharge.

RATED VOLTAGE	48 V
RATED CURRENT	28A
RATED SPEED	750 W
GRIP	1.1-4.2V BRAKE
UNDER VOLTAGE	42+IV

Throttle

It is used to accelerate the vehicle and maintain the speed of the vehicle. Whenever the throttle is an action, at that time throttle is converted signal and signal is Supply to the controller. Controller is supplied signal to motor, and motor starts acceleration.

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5. CONCLUSION

The objective of a comfortable, compact, high speed and efficient bicycle can be achieved by this various experiment results obtained by different authors by advancement in current E-bike model. This advancement includes the pre-discovered results from literatures like the selection of materials of frame tubes, aerodynamic design.

The calculated No load speed of bicycle is =40 Km/hr

The Required power is =591.69 watt

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