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Design and Manufacturing of Hybrid Bicycle

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Abstract – *There is accessibility of power in India however as the electric bike expects 4 to 6 hours to charge their batteries, we don't have enough time to remain there for 4 to 6 hours until the batteries gets completely charged. Likewise when the batteries will have released amid voyage, it is absurd to expect to charge the batteries right then and there. So in this plan we have proposed a framework which can charge the batteries whenever, anyplace and with no utilization of module control supply. We have been structure a framework which deals with the human power. This human power is given to the pulley of alternator through a chain sprocket instrument and pulley belt component. These systems are utilized to change over 15 to 20 rmp of pedal into more than 800 rmp of alternator pulley. 800 rpms are sufficient for an alternator to create an electric power, which is utilized to charge the batteries. The alternator gives 12-volt DC yield. Additionally 2 another alternators are associated with front and back wheels of bike which will constantly charge the batteries amid the voyage. There is no such sort of configuration exist in market in India till today.*

Key Words: **Hybrid vehicle, Existing electric bike, Hybrid bicycle**

1. INTRODUCTION

The hybrid system is any system which works by using two or more distinct fuels for its working. For example, in electro-petroleum bicycle, it uses battery to drive the motor and when batteries get discharged, it starts engine using petrol to charge the batteries and also keeping the bicycle in running.

1.1 Concept of Hybrid Bicycle

Our Hybrid Bicycle comprise two sort of frameworks. One is having an motor and batteries used to drive the bike. The other framework comprise of an alternator which changes over mechanical pivots into electrical vitality. In the second framework we have utilized chain sprocket system and pulley belt instrument for changing over the low rpms of pedal into high rpms of alternator pulley. After age of electric vitality by the alternator, this vitality is put away in the batteries for further use. Thus, this Hybrid Bicycle needn't bother with the outside power supply to charge the batteries, yet for detail we have given a modules to the charging of battery by giving supply.

1.2 Design of our system

In India the power is effectively not accessible according to the necessity. For Plug-in Electric bike the battery charging is finished by utilizing electrical supply to the framework. As an inaccessibility of power amid adventure is significant hindrance for this framework. So to defeat this issue, we have structured a framework which can charge the batteries utilizing human power and another get together uses the revolution of wheels to charge the batteries.

When we begin pivoting the pedal, it will turn the associated chain sprocket and pulley sprocket system. The sizes of pulleys are taken according to the computation for getting in excess of 800 rpms from 15 to 20 rpms. The produced 800 rpms are utilized to drive the alternator for age of power, which is utilized to charge the batteries. Another 2 alternators are appended to front and back wheels through an exceptional kind of belt. After the bike begins voyaging, these 2 extra alternators associated in arrangement will persistently charge the batteries without utilizing human endeavors. Presently, onwards framework is like that of electric bicycle.

2. METHODOLOGY

2.1 Problem Definition

In electric bike framework we can charge the batteries by utilizing power supply just, which expend additional time that can be dangerous now and again because of inaccessibility of charging stations at whatever point we require. It is a noteworthy issue in rustic regions. Consequently in India, the electric vehicle is generally favored for city and little voyage modes.

2.2 Concept

In this framework we have utilized the idea of RPM transformation instrument to change over the 15-20 RPMs given from the physical intensity of human into in excess of 800 RPMs to drive the alternator. These frameworks just believer the physical vitality into mechanical vitality and after that into electric vitality. This electric vitality will have used to drive the motor. Extra alternators are utilized to create the electric vitality amid the adventure.

2.3 Construction Components

Battery:

Voltage – 12V
Capacity – 24 Ah
Type – Zinc Ion Battery

Fig-1: Battery

Alternator:

Fig.2: Alternator

Output voltage 12 volt
Output current 40 Ampere

Chain sproket and pulley belt mechanism:

Fig.3: Chain-Sprocket mechanism

Fig.4: Pulley-Belt mechanism

Motor:

Fig-5: Motor

Type – BLDC Geared motor.
Operating Voltage – 24Volt DC
Output Capacity – 250W
RPM (after reduction) – 300
Full load current – 13.4 A
No load current – 2.2A
Torque constant – 8 N.m (400 kg-cm)
Sprocket – 9 Tooth only fits bicycle chains

2.4 Working

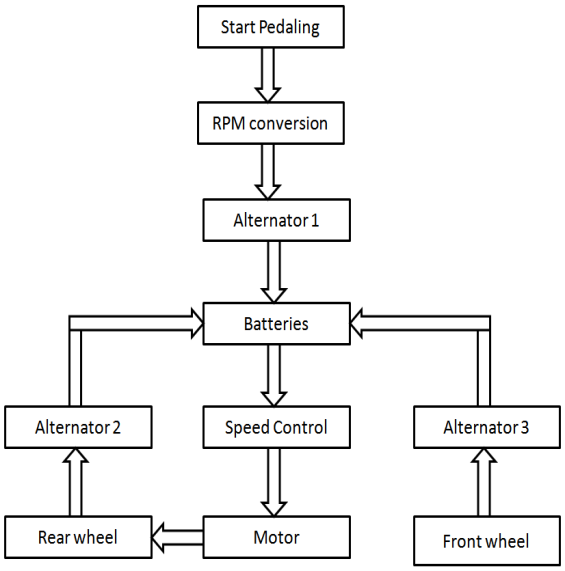

Fig.6: Block diagram of proposed system

When we begin to turn the pedal it will pivot the alternator pulley through the chain sprocket and pulley belt instrument. The electric vitality produced by the alternator is given to the batteries for their charging. The electric vitality put away in the batteries is utilized to drive the engine. The speed of engine is constrained by utilizing the controller which essentially comprises of a potentiometer which changes the voltage gave to the motor. From other two alternators, one is associated with the back haggle is associated with the front wheel; both are associated with individual wheels through an uncommon sort of belt which is utilized to keep both the alternators in same phase. Along these lines, because of such course of action of alternators to

wheels, the batteries gets ceaselessly charged amid the adventure.

2.5 Calculations

2.5.1 RPM conversions

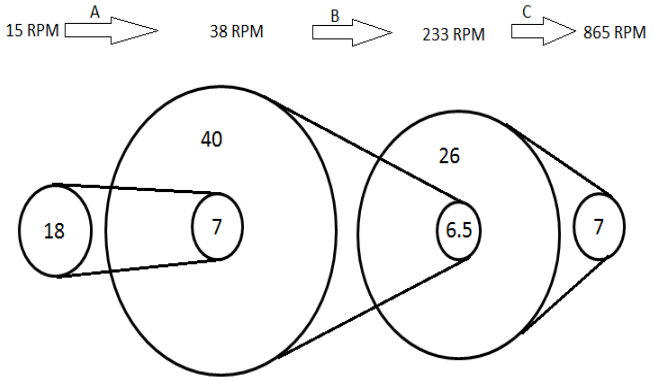

Fig.7: RPM calculations

RPM Conversion formula

(rpm1 * d1) = (rpm2 * d2)

1. Calculation of A
   (15 * 18) = (A * 7)
   A = 38.57 rpm

2. Calculation of B
   (38 * 40) = (B * 6.5)
   B = 233.84 rpm

3. Calculation of C
   (233 * 26) = (C * 7)
   C = 865 rpm

2.5.2 Batteries and Motor calculations

1. Power of battery
   (Voltage * Ah rating) = power in Watts
   Here, series connection of two batteries gives 24 volts and 24 Ah rating.
   Therefore,
   (24V * 24Ah) = 576 Watts

2. Power of motor = 250 Watts

3. Number of hours run to a consume the total power of battery

$$\text{Hours} = \frac{\text{power of battery (V*Ah)}}{\text{power of motor (Watt)}} = \frac{576}{250} = 2.304 \text{ hr}$$

4. Laboratory range of battery
   = (Number of hours' motor run * 25kmph)
   = (2.304 * 25)
   = 57.6 km

2.6 Comparison between Electric bike & hybrid bicycle

Table -1: Comparison between Electric bike & hybrid bicycle

Sr. No	Parameter	Electric Bike	Hybrid bicycle	Conclusion
1	Charging Type	Plug-ins	Alternator + Plug-ins	Alternator gives comparative capacitive to charge the battery.
2	Energy Mode	Electric Battery	Electric Battery +Human power	Uses physical and electrical energy. Since it is hybrid bicycle.
3	Efficiency	Generally 45km per charge.	Higher efficiency due to the additional alternators.	Hybrid bicycle is more Efficient
4	Cost	High	Slightly less	Affordable user
5	Maintenance	Less	More	More elements in assembly
6	Weight	Less	Slightly high	Additional weight of components like motor & Alternator

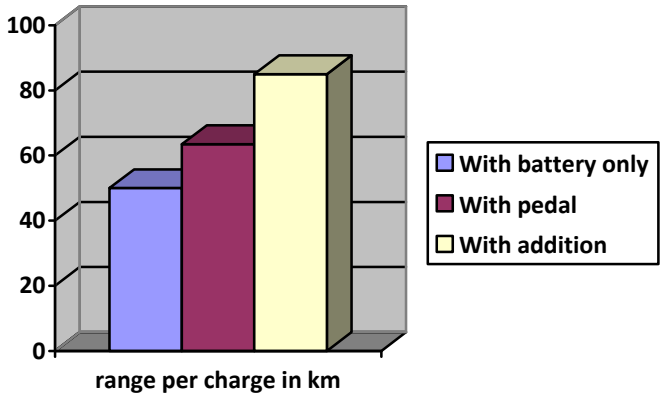

Chart -1: Comparison between Electric bike & hybrid bicycle

Above graph demonstrates the near range per charge in km of bike when it is utilized just batteries, batteries with pedal and batteries with extra alternators separately.

3. CONCLUSIONS

According to above discourse, our framework is increasingly productive as contrast with existing electric bike as a result of recently structured component for charging of batteries in which human power is utilized to trigger the framework. What's more, this will charge the batteries proficiently. It has a solitary disadvantage; it requires human endeavors to trigger the framework. Its significant leverage is, it is a contamination free vehicle.

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