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Self-Generated Electric Bicycle

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Abstract*:* Revolution for the eco-friendly technologies bicycles was the most depended modes of transportation. By considering increase in price of fuel and the environmental factors must admit that for short distance travelling it is always good to use a bicycle than a motor vehicle. Imagine how useful would the bicycle be if even the small effort applied by men for climbing slopes and riding on rough terrain is reduced in it. The same way to develop the basics is "the e-bike". The unit developed is a bicycle with an electric power motor and alternator that would assist the rider throughout his journey. During the ride, alternator generates electricity which stored in batteries and motor is fed from those batteries. The system modified in such a way that the rider can make choice of which mode he prefers. The rider can be chosen that the bicycle to be driven completely with the electric motor or to be driven manually by him that is by pedalling. The motor and alternator mounted on the bicycle wheel are to carry the extra little weight which the rider taking along with the bicycle.

Keywords: rough terrain, choice of which mode, reduce the effort.

I. INTRODUCTION

The transportation in all over world is going to increase in small time period, where advanced vehicals which gives more comfort to human but also affect the human health. Electrical bicycles have been gaining increasing attention worldwide. For the personal transportation the bicycle is the best option. And bike is better than the bicycle, but it requires a fuel to ride and it also creates a environmental effect. The bicycle is drive with the help of electric power. Electrical bicycle uses an electric motor, alternator and battery system, in which riders have to pedal the bicycle and the generated electricity in the generator, is stored in storage battery. The stored energy can be used for riding the bicycle. Electrical bicycle can be used for a variety of purpose.

II. WORKING OF SELF POWERED ELECTRIC BICYCLE

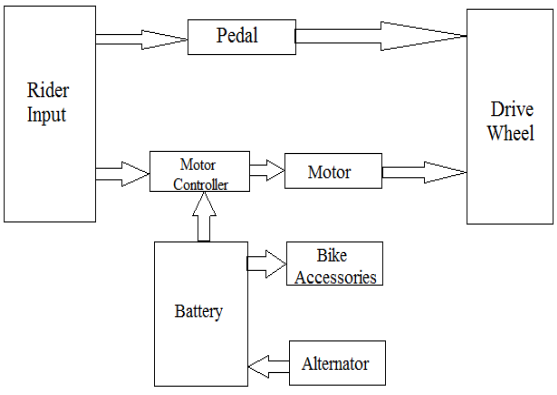

Fig 1. Schematic diagram of Electric Bicycle.

Instead of bicycle wheels, here BLDC HUB Motor is used which works on 48 volt DC supply, Front wheel has brushless generator which produce three phase electrical energy. This three phase energy is converted into DC via three phase AC to single phase DC converter. This DC supply is used to charge battery and to control of back wheel here BLDC motor controller is used. Two 48 volt DC battery sets are used here, when first battery set gives supply to bike, simultaneously second battery set become charged from alternator. When first battery set gets completely discharged then change over switch switches to second battery set. Means now the first battery set is charging & second battery set gives supply to the bike.

COMPONENTS:

1. BLDC HUB MOTOR:

Brushless DC motors have been in commercial use. Brushless dc motors develop a maximum torque when stationary, And it will be linearly decreasing as increase in velocity. Some limitations of brushed motors can be overcome by brushless motors such as higher efficiency and a lower susceptibility to mechanical wear.

Permanent magnets which are placed in a brushless DC motor those magnets rotate around a fixed armature, eliminating problem associated with the connecting current to the moving armature. An electronic controller replaces brush or commutator assembly of brushed dc motor turning. By using solid state circuit the controller distribute the timed power. The brush or commutator system is replaced by the solid state circuit.

Brushless DC motors have more advantages than DC motors ,which includes more torque per weight, more torque per watt (more efficiency) more reliability, less noise, longer lifetime (no brush and commutator erosion), ionizing sparks from the commutator are also eliminated the electromagnetic interference (EMI) are also reduced. The windings can be cooled by conduction itself. It does not require any air flow inside the motor for cooling. This in turn means that the motors internals can be completely enclosed and protected from dirt and other foreign particles. Brushless motor commutation can be developed by using a microcontroller or microprocessor, or it may be developed in analog hardware, or in digital firmware. Commutation allows greater flexibility and capabilities

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which are not available in brushed DC motors. Including speed limiting, "micro stepped" operation for slow and fine motion control and holding torque when stationary.

The maximum power that can be applied to a brushless motor is limited by heat, but too much heat reduces the properties of magnet and may damage the insulation of the windings.

2. Twist Throttle:-

A twist throttle is a handle that can be twisted to operate and control the motor. It is commonly connected at the right handle bar of motorcycle, but sometimes it can be connected elsewhere, such as on a bicycle as a gearshift.

3. Cycle Frame:-

The frame is made by welding aluminium or steel (or alloy) struts, with the rear suspension being a major component in the design of the bicycle. Carbon fibre, titanium and magnesium are used in a few very expensive custom frames.

The frame includes the head tub that holds the front fork and allows it to pivot. Some motorcycles include the engine as a load-bearing stressed member; this has been used all through motorcycle history but is now becoming more common.

Oil in frame (OIF) chassis, where the lubricating oil is stored in frame of the motorcycle, was used for Vincent motorcycle of the 1950s, and for a while during the 1970s on some NVT British motorcycles.

Today it is a used on some" thumpers"(single-cylinder four-strokes) that usually have dry sump lubrication requiring an external oil tank. It has since gained some cachet in the modern bike world too because it saves the space and also it can afford the reference to an earlier era.

4. BATTERY:

An electric battery has one or more electrochemical cells. The battery converts stored chemical energy into electrical energy. Each battery cell has positive terminal and a negative terminal that is cathode and anode.

Primary (single use or "disposable") batteries are used ones and discarded the electrode materials are irreversibly changed during discharge.

Common e.g. are the alkaline battery used for flash light and a multitude of portable devices. Secondary (rechargeable batteries) batteries can be recharged and discharged for many more times. The original composition of the electrodes can be restored by reverse current. The lead acid batteries are used in vehicals and lithium ion batteries are used as portable electronics source.

The 2 battery sets are used, each set having a 4 batteries connected in series. Each battery has rating of 12 volt, 7Ampere DC Power.

III. THEORETICAL BACKGROUND

The total power (P_{Total}) required to drive the bicycle is given by the sum of power required to overcome the oppose caused by the air (P_{Drag}), the power required to overcome the slope of ground (P_{Hill}), and the power required to overcome the friction ($P_{Friction}$).

$$P_{Total} = P_{Drag} + P_{Hill} + P_{Friction}$$

$$P_{Hill} = 9.81 \times G \times vg \times m,$$

$$P_{Friction} = 9.81 \times m \times Rc \times vg.$$

The three cases that can be distinguished according to Wilsons Bicycle Science correspond to the following riding conditions:

Case 1:

At speed greater than 3 m/s, the majority of the power required to overcome the air drag

For flat ground and high speed:

$$P_{drag}, P_{hill} = 0, P_{drag} > P_{Friction}$$

Case 2:

At speeds less than 3 m/s and at level surface, the majority of the power is used to overcome the rolling resistance.

For flat ground and low speed:

$$P_{Friction}, P_{hill} = 0, P_{Friction} > P_{drag}$$

Case 3:

For higher slope, the power required to overcome air drag and rolling resistance is small when it is compared with the power required to overcome the lower slope.

For hilly ground and low speed:

$$P_{hill}, P_{hill} > P_{drag}, P_{hill} > P_{friction}.$$

IV. RESULT

Speed(Kmph)	Generator Output(Volts)
10	35-40
20	40-48
25	54

Exact model of the battery as shown in above figure. The 2-sets of batteries are connected both side of cycle. When rider ride the bicycle then one side of battery geting charged.

when one set is charged then automatically second side starts charging.

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