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Innovative Electrical Energy Generation From Bicycles Waste Rotational Energy

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Abstract

In this paper, the main objective is to convert the rotational energy of the rare wheel of the bicycle into electrical energy so that we can recharge the battery & run the bicycle by this energy up to certain distance. We know that the supply of fossil fuels are limited & their utilization as energy source causes environmental degradation due to unfinished ignition when used as energy source. Here, the aim is to present the idea of harnessing the various energy & use it in today's existence of human life & to shift away from conventional based fuels to using renewable sources of energy is must. Electric bicycle which will be driven with help of battery & thus provide required voltage to the motor. The focus is to generate power from vehicles waste energy. It produces no pollution & also provides healthy exercise to the user. This can be drive with the help of the pedal or electricity. The rider can charge the battery while moving with the help of the dynamo or alternator which convert the mechanical energy to electrical energy. Therefore the manufacturing of such bicycle is indispensable.

Keywords- Bicycle, Pedal, Battery, Dynamo, Electricity.

Literature Review

Koref et al., (2007) discussed the following concepts:

To optimize endurance cycling performance, it is important to maximize efficiency. Power-measuring cranks and force-sensing pedals can be used to determine the mechanical effectiveness of cycling. From both a coaching and basic science perspective, it is of interest if a mechanically effective pedalling technique leads to greater efficiency. Thus, the purpose of this study was to determine the effect of different pedaling techniques on mechanical effectiveness and gross efficiency during steady-state cycling.

Rajneesh et al., (2014) discussed the following concepts:It is known that the supplies of fossil fuels are limited and their utilization as energy source causes environmental degradation due to unfinished ignition when used as energy source, in addition to this as the world population increase the order for energy sources increases, so the issue of a steady replacement of fossil fuels with renewable energy source is of major consideration for most countries. Power generated by pedaling can be converted from mechanical to electrical energy by using either dynamo or alternator.

Dhiraj et al.,(2017) discussed the following concepts: wheel vehicle, which is being powered by a rider and can be steered using a handle. It is one of the most eco-friendlier and an economical mode of transport word wide. The rotary motion of bicycle is efficient and can be use for multitasking purpose. One of which is Drainage system which works on the rotary motion to control the disposal of wastages and with regular filtration of wastages. Drainage pipes are using for the disposal and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. To overcome this problem and to save the human life Rather than it helps to protect the environment from different kinds of environmental hazards through the promotion waste management by the removal of garbage from the drainage system. Second is Electricity. Renewable power generation system is currently preferred for clean power generation.

Kunjan (2017) discussed the following concepts:

The idea of harnessing the various energy and use it in today's existence of human life. For human being travelling has become vital. In order to sustain in this fast forward world he must travel from place to place. It is very important that time taking for travelling should be less, also it should be economical and easily available. With the fast depleting resources of petrol and diesel, there is need to find intermittent choice. Electric bike which will be driven with the help of battery and thus provide required voltage to the motor. The focus of this report is to perform power calculations and system design of this Electric Bike. This bike can be driven with the help of electricity or also with the help of solar energy. Therefore the manufacturing of such bike is indispensable.

Zhenying et al., 2012 discussed the following concepts:

They are fast so that e-bikers can cut down their commute time and allow them to ride more frequently than if they ride traditional bikes, especially during hot and windy days. The ease of acceleration makes obeying stop signs or riding uphill less onerous and provides e-bikers with more confidence when only vehicle lanes are available to bikers. They also provide those who, for various reasons, don't or can't ride traditional bikes an option for green transportation. Finally, they enable people with certain disabilities, because of illness or aging or time constraint, to continue to bike, with the help of electric motors when needed [5].

Introduction

It is the Energy which control whole universe and energy is the symbol of importance. Energy is the need for everyone from our ancestor to our future generation. There is much historical evidence which prove that many war took place to gain more and more energy resources. In addition to energy resources, energy conservation and energy use efficiency are also key factor for avoiding the situation of energy deficiency. So everyone is looking for more efficient and long-lasting techniques and more energy resources as well to feed the giant industries which are working day and night for the luxury of citizens. Round the clock, the consumption of energy is increasing leaps and bounds. An electric bicycle is simply a light electric transportation device which is meant for personal transportation. It is a kind of vehicle which does not produce any kind of pollution because it runs on electricity. Basically it is cycle which can be run by pedaling and reuse of waste energy as shown in figure no.1 it consist of DC motor and one Lead acid battery (48 volt 7 Ah).

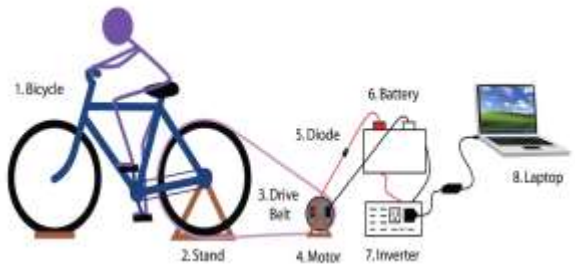

Fig. 2 power

A/c to the energy conversion law, energy neither be created nor be destroyed but can be transformed from one place to another. But we are wasting resources that can produce energy as if they are limited. Humans are able to generate approximately 150W of power while riding bicycle. If we make use of this energy, would be able to charge the battery. A dynamo or an alternator can be used for harvesting the energy generated by a cycle rider while riding.

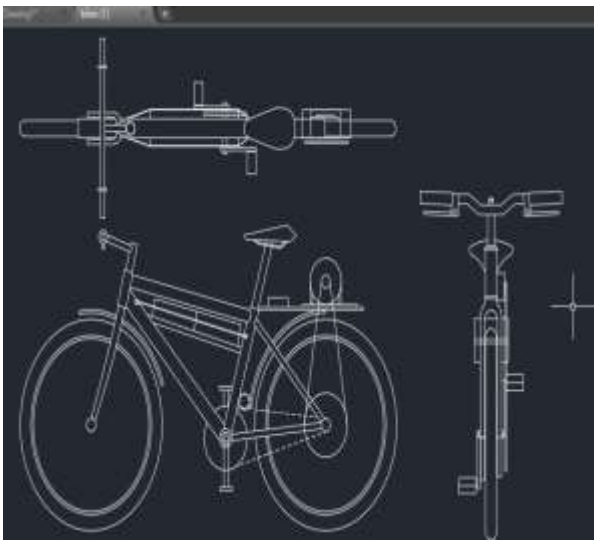

Fig.2 Model of the Proposed System

This is a system for recovering the moving kinetic energy and also to convert the usual loss in kinetic energy into gain in kinetic energy. When riding a bicycle, a great amount of kinetic energy is lost while moving, making start up fairly strenuous. Here we used mechanical kinetic energy recovery system by means of a dynamo and DC motor to store the energy which is normally lost during moving of the Bicycle, and reuse it to help propel the rider while riding. The rider can charge the battery while moving.

- General Design Considerations

Generally, the design of this system depends primarily on the ratings of the DC permanent magnets which produce the DC and the required output power. The output power to be produced affects the dimensioning as well as the input parameters like torque, speed, etc. In light of the above constraints, the following design considerations and assumptions has been made for this project design;

Sizing and economic considerations: This system is design to compact in consideration of the power requirement as well as reduction in the cost of fabrication. For affordability, the device is relatively small.

Safety Considerations: This system is design in such a way that women and children can use it for sustained period of time. It preserves the safety of our immediate environment from noise and air pollution because it's noiseless and smokeless. Stability of the unit was also considered to ensure that the equipment remains upright at all time, i.e. it should not drift or bend to one direction and it should remain stationary.

- **Working (Different parts of our project)**
- **Fitting of DC Motor.**

First step is to fit the DC motor at the carrier with base plate, nut bolts and then align it with the rear wheel big sprocket. Then Put on the Chain between motor sprocket and rear wheel sprocket. Motor sprocket is of small size having 29 teeth and rear wheel sprocket is of big size having 120 teeth. Bicycle will run by small sprocket which is at the other side of the wheel which is connected to pedal big sprocket by chain.

The motor is having 850 watt. Capacity with maximum 1800rpm. Its specifications are as follows:

Current Rating: 7amp

Voltage Rating: 48 Volts

Cooling: Air – cooled

Motor type: Brushless

Fig.3. DC Motor

- **Fitting of Dynamo.**

First we connect the small gear of 9 teeth on the shaft of dynamo and fit the dynamo in between the front axis and rear wheel central axis above the chain. When cyclist run the cycle, chain will rotate which run the dynamo, dynamo produces the current between 6v-12v it varies according to the speed of the pedaling. Dynamo is connected to the battery which stores the energy in it and we can use this energy to run the cycle when the cyclist got tired.

Fig.4. Dynamo

- **Fitting of batteries.**

We will fit the batteries between handle and seat. Connection of the batteries will be in series, and fitting of batteries inside the two rods. It takes the input energy from the dynamo stores the energy and supply the output energy to the motor when required.

Fig.5. Battery

- **Connecting controller and throttle.**

Then we will provide the connection of controller to DC motor, throttle, dynamo, controller provide the variation in speed which help the cyclist to regulate the speed according to him.

Fig.6. Controller

Fig.7. Throttle

FINAL PROJECT

- **Specification**

S.No	***Component used Ranger Bicycle***	***Technical specification***
1	Dc Motor	550V dc motor 1440 Rpm
2	Batteries	4 Batteries of 12V, 7 amp.
3	Dynamo	6 Volt
4	Controller	48 Volt
5	Throttle	3 Phase

- **CONCLUSION**

With the increasing consumption of natural resources of petrol, diesel it is necessary to shift our way towards alternate resources like the Electric bicycle and others because it is necessary to identify new way of transport. Electric bicycle is a modification of the existing cycle by using electric energy and also solar energy if solar panels are provided, that would sum up to increase in energy production. Since it is energy efficient, electric bicycle is cheaper and affordable to anyone. It can be used for shorter distances by people of any age. It can be contrived throughout the year. The most vital feature of the electric bicycle is that it does not consume fossil fuels thereby saving crores of foreign currencies. The second most important feature is it is pollution free, eco – friendly and noiseless in operation. For offsetting environmental pollution using of on – board Electric Bicycle is the most viable solution. The Operating cost per/ km is very less and with the help of solar panel it can lessen up more. Since it has fewer components it can be easily dismantled to small components, thus requiring less maintenance.

Future Scope..... We have represented a very basic idea in the field of battery cycle, but there is great future scope for it.With new improvements and technology, it can be proved commercially successful in near future The use of computers and sensors can enhance the performance of this device up to a great extend.

Computers and motors in the base of the device can be used, to keep the Battery cycle PT upright when powered on with balancing enabled. A user can command the Battery cycle to go forward by shifting their weight forward on the platform and backward by shifting their weight backward. The Battery cycle notices, as it balances, the change in its centre of mass, and first establishes and then maintains a corresponding speed, forward or backward. Gyroscopic sensors and fluid-based levelling sensors are used to detect the shift of weight. To turn, the user can manipulate a control on the handlebar left or right. We hope that the Battery cycle can go up to 12.5 miles per hour (20.1 km/h) by using better motor and sensors.

In Near Future…..

The dynamics of the Battery cycle will be similar to a classic control problem, the inverted pendulum. The Battery cycle PT (PT is an initialize for personal transporter while the old suffix HT was an initialize for human transporter) has electric motors powered by Valence Technology phosphate-based lithium-ion batteries which can be charged from household current. It will balance with the help of dual computers running proprietary software, two tilt sensors, and some gyroscopic sensors. The servo drive motors rotate the wheels forwards or backwards as needed for balance or propulsion. The rider will be able to control forward and backward movement by leaning the Battery cycle relative to the combined centre of mass of the rider and Battery cycle, by holding the control bar closer to or farther from their body. The Battery cycle will be able to detect the change in the balance point, and adjust the speed at which it is balancing the rider accordingly. Newer models will be able to enable the use of tilting the handle bar to steer.

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