

Regenerative Electric Bicycle

Niraj K Naik

Abstract :- This project describes about the process of designing and modeling of a regenerative electric bicycle. It provides detailed information and challenges of modifying an existing mechanical system to one based on human propulsion as well as a set of electro-mechanical interface that provide assists. Our project is based on economical criteria and also the energy can be reused whenever required. The main idea for making this project is to make vehicle which can be used to generate energy by driving a bicycle (mechanical to electrical energy conversion) and using the same energy later to drive the bicycle (electrical to mechanical energy conversion). Since it generates and reuses the same energy it is known as “Regenerative Electric Bicycle”

Keywords:- Green Technology, Regenerative Bicycle

I. INTRODUCTION

There are various renewable energies sources which are available in many different forms. In addition, people use fossil fuels, which are non-renewable. Power generation using bicycle is very cheap and economical and also eco-friendly in use. In addition in cities, where most people use bicycle for workout in gyms, this energy can be productively used for power electronic gadgets, which requires less and efficient power in its working process.

A regenerative electric bicycle also known as an electric-bike, it is a bicycle consisting of an integrated electric motor which can be used for generation, storing and re-using purpose. E-bike uses rechargeable batteries, which helps it to store the power and reuse it whenever required and the lighter varieties can travel from 16 to 20km/h, while the more high-powered varieties can often do in excess of 45km/h. Regenerative electric bicycle are electric motor-powered versions motorized bicycles which has many more advantages when used. This unit requires 8 hours to charge the battery used for this project, which provides the range between 25 to 30 miles at speed of 20km/h.

The main ideology behind this project, Regenerative electric bicycle, is the combination of two earlier mentioned technologies that is power generation using bicycle and consumption of power in same vehicle. In simple words, we generate power by driving the bicycle through Permanent magnet DC motor and store it in batteries are completely charged, to drive the same bicycle. Hence there is a production and consumption of power in same vehicle.

II. BACKGROUND OF THE PROJECT

The project working process in short in this figure. This project is basically based on eco-friendly type in which we can use a vehicle without using of petrol. The process in the project is about storing and converting energies into different forms and using it in a eco-friendly way.

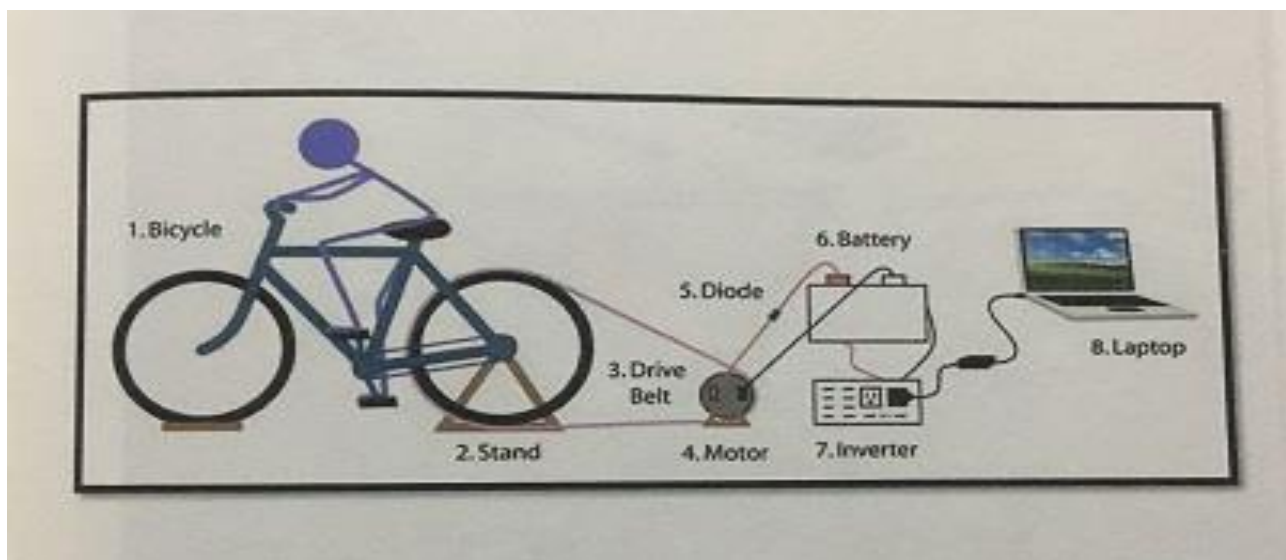


Fig 1

Power= 1/4HP

I = 9.75amps

V = 24v

Now,

$$2 \pi N T_L / 60 = \text{Power}$$

$$2 \pi \square \square_L / 60 = 187$$

$$T = 1.19 \text{ n-m}$$

Torque available at the motor shaft end = 1.19 n-m

According to the assumption torque required at the wheel = 9 n-m

$$\text{Reduction ratio} = 9/1.19$$

$$= 7.56$$

that is 7

III. MAIN COMPONENTS

A. Bicycle :

A bicycle does not require any fuel for its operation and it's the main advantage over many other commutating devices. The initial cost and maintenance cost of the bicycle is also negligible. Besides this there are no dangerous gases like CO,CO₂,SO_x,NO_x, given out by its operation. We can say that running a bicycle is completely eco-friendly and economical. Riding a bicycle is very useful for good and appropriate health issues. One can develop a strong heart and muscular limbs by using of bicycle

A bicycle with gears or without gear can be used. Using a geared gives a lot more comfort while driving but it makes the assembly and further modifications difficult to carry. Also it requires relatively frequent maintenance as compared to non-geared bicycle. A non-geared bicycle is easy in design and simple in construction. Hence we are using anon-geared bicycle. We have used a non-geared 'Hercules Thriller' bicycle in this project. This bicycle is a second hand bicycle and its cost is low. It requires negligible upgrades to retain its working condition.

B. Permanent magnet DC motor :

This electric motor is a motor that converts electrical energy into mechanical energy. In normal working condition, most electric motors operate through the interaction between an electric motors magnetic field winding and winding currents to generate force within the motor. A permanent magnet DC motor with commutator only needs something to turned its shaft in order to function as a generator. This generated DC voltage which is generated by the motor by pedaling will be proportional to the speed at which the shaft rotates and will about equal to the voltage required to operate the motor at speed at which the shaft rotates.

A permanent magnet DC motor without commutator is brushless DC motor. If there is no internal electronic commutator or if the electronic commutator can be removed, the motor needs some king of force which helps it to turn its shaft which is been connected to the motor itself in order to function as a generating unit. It will generate AC voltage, and generated voltage and frequency will be directly proportional to the speed at which the shaft rotates. The generated voltage at normal operating speed will be comparable to the normal operating voltage.

A DC motor without a permanent magnet requires current to be supplied to the field winding in order to function as a generator. Access to internal connection points may be required to connect an external power supply to its field winding. The motor, acting as a generator, can probably supply its own field current once generation begins. There may or may not be enough residual magnetism in the motor to get generation started. In all cases, the safe operating current is comparable to current that the motor requires at full load.

C. Motor speed control using IC555 :

This figure refers to the motor speed control using IC555, The stages are been shown in the figure.

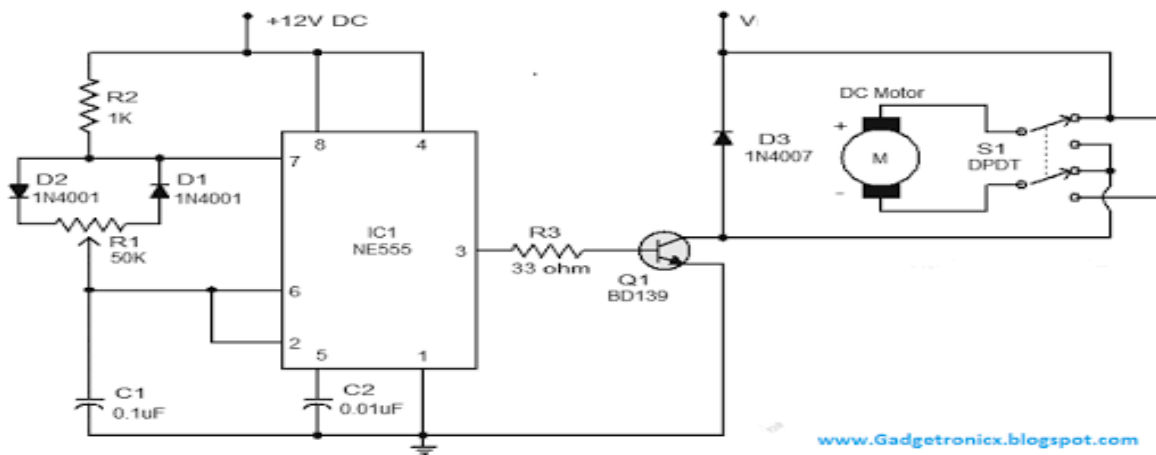


Fig 2

D. Sealed Lead acid battery :

The battery used for this project is lead acid battery, this battery in our project helps to store the charge and whenever required we will take the stored charge from the battery.

E. Charging circuit :

This is the figure of charging circuit. As we have connected two 12V batteries in parallel with the equivalent voltage of the circuit is 12V DC.

This figure shows about the charging circuit of battery used in this project.

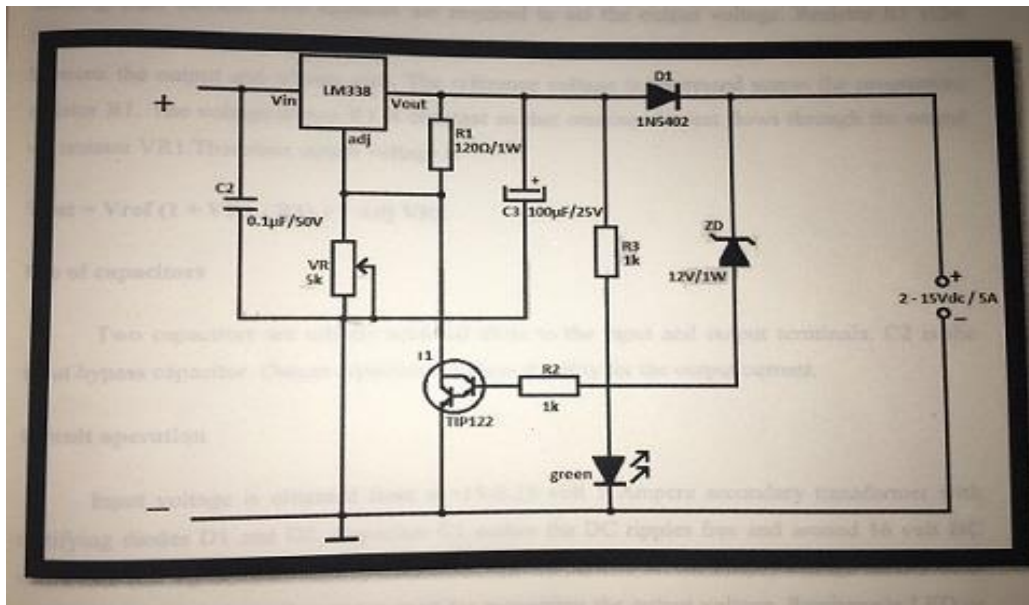


Fig 3

IV. CONCLUSION

A regenerative electric bicycle is a low cost, negligible maintenance and most importantly a pollution free self commutated vehicle. Independency on the fossil fuel is the main advantage of vehicle different from conventional vehicles. The regenerative electric bicycle as well as generate voltage across the terminal of the motor. It has simple construction and working.

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