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ELECTRIC BICYCLE

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ABSTRACT

As we know know a day's Fuel prizes goes on high level so everyone finding new way to protect our self from that rising prices so E-bike is one solution for save fuel.

Difference between conventional E-bike and our e bike is the regenerative charging we are providing. The machine we are using as a motor will act as a generator when it is on generating mode. Our aim was to make an e bike for a rider with the weight range between 40 to 50 kg and to make a vehicle which will not pollute the environment. Our e bike consist of a 24v, 250w, PMDC motor and two batteries of 12v with the current rating of 18ah and a motor controller to control the speed of our bike. The batteries we are using are non- polluting, they don't consist of any acid and they also don't required any kind of maintenance, they are absolutely maintenance free.

We have connected the motor to front wheel which is the part of experiment we wanted to perform. A switch is provided on the bicycle to select the mode of operation i.e. generating mode or motoring mode (default mode is generating mode).

When we are paddling the bicycle the switch should be on generating mode, hence the motor will act as a generator there by providing charging to the battery. And when the switch is on motoring mode the motor will drive the bicycle and the rider.

We know that same machine can be used as motor as well as generator. We are using the same principle in our project. The machine which we are using as a motor (PMDC) the same machine will be used as generator.

When the supply is connected to motor it will convert electrical energy into mechanical energy and when the same machine is rotated by some external means i.e. when mechanical energy is applied to it, it will convert that mechanical energy into electrical energy. Our motor cum generator is able to produce up to 24 v at rated speed. To convert motor into generator we just need to turn the DPDT (Double pole Double Throw) switch down provided on bicycle and the motor will ac.

Keywords: About five key words in alphabetical order, separated by comma

I. INTRODUCTION

During the revolution for the eco-friendly technologies bicycles were the most depended modes of transportation, along with this the consideration of the increase in fuel price and the environmental factors we must admit that it is far more better to use a bicycle over a motor vehicle for short distance travelling. Imagine how useful would the bicycle be if even the small effort applied by man for climbing slopes and riding on rough terrain is reduced in it. We thought the same way to develop the basics of our project "The e-Bike". E-bike or Electric bike is nothing but a vehicle which is driven by an electric motor.

An electric bicycle, also known as an e-bike or booster bike, is a bicycle with an integrated electric motor which can be used for propulsion. There are a great variety of e-bikes available worldwide, from e-bikes that only have a small motor to assist the rider's pedal-power (i.e., peddles) to somewhat more powerful e-bikes which tend closer to moped-style functionality: all, however, retain the ability to be pedalled by the rider and are therefore not electric motorcycles. E-bikes use rechargeable batteries and the lighter varieties can travel up to 25 to 32 km/h (16 to 20 mph), depending on the laws of the country in which they are sold, while the more high-powered varieties can often do in excess of 45 km/h (28 mph). In some markets, such as Germany, they are gaining in popularity and taking some market share away from conventional bicycles, while in others, such as China, they are replacing fossil fuel-powered mopeds and small motorcycles.

II. LITERATURE SURVEY

In the 1890s, electric bicycles were documented within various U.S. patents. For example, on 31 December 1895, Ogden Bolton Jr. was granted U.S. Patent 552,271 for a battery-powered bicycle with "6-pole brush-and-commutate direct current (DC) hub motor mounted in the rear wheel." There were no gears and the motor could draw up to 100 amperes (A) from a 10-volt battery.

Two years later, in 1897, Hosea W. Libbey of Boston invented an electric bicycle (U.S. Patent 596,272) that was propelled by a "double electric motor". The motor was designed within the hub of the crankset axle. This model was later re-invented and imitated in the late 1990s by Giant Lafree e-bikes.

By 1898 a rear-wheel drive electric bicycle, which used a driving belt along the outside edge of the wheel, was patented by Mathew J. Steffens. Also, the 1899 U.S. Patent 627,066 by John Schnepf depicted a rear-wheel friction "roller-wheel" style drive electric bicycle. Schnepf's invention was later re-examined and expanded in 1969 by G.A. Wood Jr. with his U.S. Patent 3,431,994. Wood's device used 4 fractional horsepower motors; connected through a series of gears.

III. HARDWARE DESCRIPTION

1.0 PMDC MOTOR

In a dc motor, an armature rotates inside a magnetic field. Basic working principle of DC motor is based on the fact that whenever a current carrying conductor is placed inside a magnetic field, there will be mechanical force experienced by that conductor. All kinds of DC motors work in this principle only. Hence for constructing a dc motor it is essential to establish a magnetic field. The magnetic field is obviously established by means of

magnet. The magnet can by any types i.e. it may be electromagnet or it can be permanent magnet. When permanent magnet is used to create magnetic field in a DC motor, the motor is referred as permanent magnet dc motor or PMDC motor. Have you ever uncovered any battery operated toy, if you did, you had obviously found a battery operated motor inside it. This battery operated motor is nothing but a permanent magnet dc motor or PMDC motor. These types of motor are essentially simple in construction. These motors are commonly used as starter motor in automobiles, windshield wipers, washer, for blowers used in heaters and air conditioners, to raise and lower windows, it also extensively used in toys. As the magnetic field strength of a permanent magnet is fixed it cannot be controlled externally, field control of this type of dc motor cannot be possible. Thus permanent magnet dc motor is used where there is no need of speed control of motor by means of controlling its field. Small fractional and sub fractional kW motors now constructed with permanent magnet.

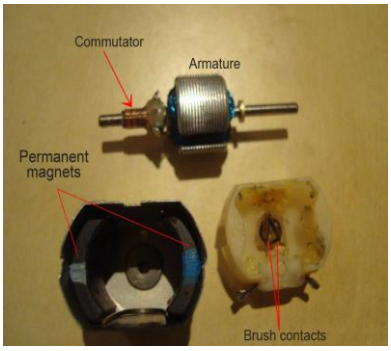

Fig.1.0 PMDC Motor

II.BATTERY

In the absorbed glass mat design, or AGM for short, the spacer between the cells is replaced by a glass fibre mat soaked in electrolyte. There is only enough electrolyte in the mat to keep it wet, and if the battery is punctured the electrolyte will not flow out of the mats. Likewise, the mat greatly reduces evaporation, to the point that the batteries do not require periodic refilling of the water. This combination of features allows the battery to be completely sealed, which makes them useful in portable devices and similar roles.

Another advantage to the AGM design is that the electrolyte becomes the separator material, and mechanically strong. This allows the plate stack to be compressed together in the battery shell, slightly increasing energy density compared to liquid or gel versions. AGM batteries often show a characteristic "bulging" in their shells when built in common rectangular shapes

AGM technology became popular in the early 1980s as a sealed lead acid battery for military aircraft, vehicles and UPS to reduce weight and improve reliability. The sulphuric acid is absorbed by a very fine fiberglass mat, making the battery spill-proof. This enables shipment without hazardous material restrictions. The plates can be made flat to resemble a standard flooded lead acid pack in a rectangular case; they can also be wound into a cylindrical cell.

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Advantages of AGM batteries

1. Imparts high reliability during service life.

2. Thicker Grids and Higher Separator Compression Prolong Life Expectancy

3. Inter-cell Weld between Cells Provides a highly reliable Low resistance Path

4. PPCP Containers with Low Permeability ensure that there is no water loss

III. CHARGING CIRCUIT

Charging circuit is used to charge the batteries. Transformer, bridge rectifier and smoothing capacitor are used in main charger circuit to obtain DC voltage .It is to transform AC voltage values coming from network to DC voltage values. We want to explain this transformation by giving information about circuit components and theirs area of usages. The block diagram of this transformation is given below

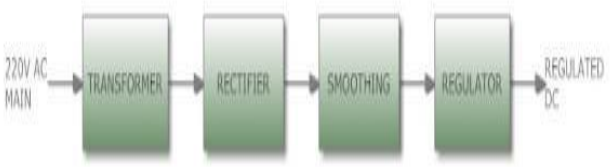

Fig.3.1 Block diagram of charging circuit

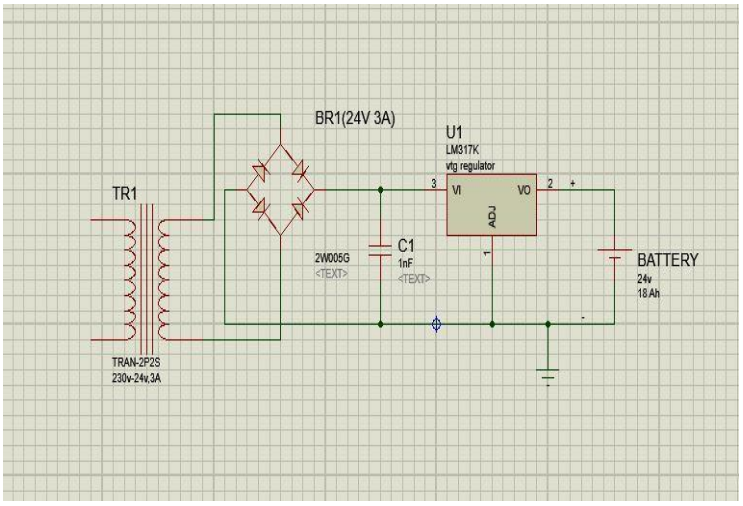

Fig.3.2 Proteus model of our charging ckt

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IV. SPROCKETS

A sprocket or sprocket-wheel is a profile wheel with teeth, cogs, or even sprockets that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which are radial projections that engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth. Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, and other machinery to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel. Early automobiles were also largely driven by sprocket and chain mechanism, a practice largely copied from bicycles. Sprockets are of various designs, a maximum of efficiency being claimed for each by its originator. Sprockets typically do not have a flange. Some sprockets used with timing belts have flanges to keep the timing belt centered. Sprockets and chains are also used for power transmission from one shaft to another where slippage is not admissible, sprocket chains being used instead of belts or ropes and sprocket-wheels instead of pulleys. They can be run at high speed and some forms of chain are so constructed as to be noiseless even at high speed. Figure 4.1shows the front and side views of the designed sprockets and the manufactured one.

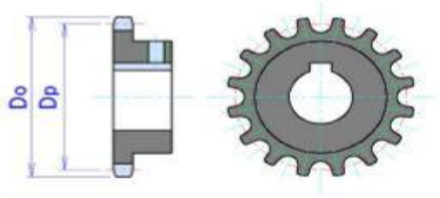

Fig.4.0 Sprockets

V.ADVANTAGES

5.1 Health benefits

E-bikes can be a useful part of cardiac rehabilitation programs, since health professionals will often recommend a stationary bike be used in the early stages of these. Exercise-based cardiac rehabilitation programs can reduce deaths in people with coronary heart disease by around 27% and a patient may feel safer progressing from stationary bikes to e-bikes. They require less cardiac exertion for those who have experienced heart problems.

5.2 Environmental effects

E-bikes are zero-emissions vehicles, as they emit no combustion by-products. However, the environmental effects of electricity generation and power distribution and of manufacturing and disposing of (limited life) high storage density batteries must be taken into account. Even with these issues considered, e-bikes are claimed to

have a significantly lower environmental impact than conventional automobiles, and are generally seen as environmentally desirable in an urban environment

The environmental effects involved in recharging the batteries can of course be minimised. The small size of the battery pack on an e-bike, relative to the larger pack used in an electric car, makes them very good candidates for charging via solar power or other renewable energy resources. Sanyo capitalized on this benefit when it set up "solar parking lots," in which e-bike riders can charge their vehicles while parked under photovoltaic panels.

The environmental credentials of e-bikes, and electric / human powered hybrids generally, have led some municipal authorities to use them, such as Little Rock, Arkansaswith their Wavecrest electric power-assisted bicycles or Cloverdale, California police with Zap e-bikes. China's e-bike manufacturers, such as Xinri, are now partnering with universities in a bid to improve their technology in line with international environmental standards, backed by the Chinese government who is keen to improve the export potential of the Chinese manufactured e-bikes.

Both land management regulators and mountain bike trail access advocates have argued for bans of electric bicycles on outdoor trails that are accessible to mountain bikes, citing potential safety hazards as well as the potential for electric bikes to damage trails. A study conducted by the International Mountain Bicycling Association, however, found that the physical impacts of low-powered pedal-assist electric mountain bikes may be similar to traditional mountain bikes.

A recent study on the environment impact of e-bikes vs other forms of transportation found that e-bikes are about:

- 18 times more energy efficient than an SUV
- 13 times moreenergy efficient than a sedan
- 6 times more energy efficient than rail transit
- About equal impact to the environent as a conventional bicycle.

One major concern is disposal of used lead batteries, which can cause environmental contamination if not recycled. There are strict shipping regulations for lithium-ion batteries, due to the safety reason. In this regard, the LiFePO4 lithium-ion battery is much safer than conventional LiCoO2 Lithium-ion battery.

VI.CONCLUSION

It is clearly seen that E-BIKE ensures a cleaner and more economical solution to the energy crisis. People use bikes and fuelled vehicles for even travelling short distances without making use of cycles and other non – fuelled vehicles. Most number of people from the list have been those which think riding a cycle is equivalent to

providing extra effort for cycling.in order to avoid this an electric assistance has been provided to the cycle that will ease the user to ride the unit with the help of a motor. Even the hardship of climbing slopes and riding on rough terrains has been reduced. All these aspects are available keeping in mind the factor of pollution being affected at all. Our e bike successfully drives the rider of weight between 40-50 kg up to 30-35 km in one charging. And the bike also generate electricity which was our aim.

VII. FUTURE SCOPE

Economics, the cost of gasoline and diesel fuel, and air pollution will affect the use of electric bicycles and bicycles in general. Today's fuel price in some nations is related to the cost of production and in other nations to the need to control imports. The price of fuel in the future will be affected by the exhaustion of reserves of petroleum and natural gas, and the need to limit (1) the pollution of the environment and (2) the generation of carbon dioxide. Atmospheric pollution by motor vehicles in cities can be prevented only by prohibiting these vehicles in downtown zones. One type of bus, used in Seattle, is propelled by a diesel engine when traveling in the suburbs and by electric trolley power in city-centre tunnels. Buses and light rail suffer from the rarely mentioned user-inconvenience features, which drove the electrified interurban railroads into bankruptcy in the 1930s. Again bicycles, and especially battery powered electric ones, can become common vehicles for commuting to downtown workplaces. The problems in bringing every day a million people to work in a skyscraper-filled downtown of a large city are easy to identify. New York City built a useful subway network with immigrant labour at a time when environmental questions did not delay construction. Today subway riders grumble but chose not to go to work in buses or cars. A subway network feeding a downtown zone would not work in Los Angeles or Seattle where the big employers are in outlying suburbs. We can look to European and Chinese cities to see that bicycling to workplaces is a solution that worked. Every day in Shanghai over a million people bicycle to work. Availability of electric bicycles would further enhance the bicycle for commuting to work

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