

Design and fabrication of an E-bicycle using DC Motor

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Abstract-Increasing demand for non-polluting mechanized transportation has revived the interest in the use of electric power for personal transportation and also reduced reliance on automobiles. A low cost alternative to an automobile is a bicycle. However, the use of bicycles has been limited to very short trips or as a recreational activity. This report describes the design of an electric assisted bicycle that will extend the range of a typical rider. The rate of improvements in technologies is at an exponential level despite that the electric bicycle is a concept that has been very feasible for years but has not been fully explored. The human electric bicycle is designed to provide electromagnetic propulsions to a bicycle therefore relieving the user of having to produce the energy required to run the bicycle. The system design is based on mechanically coupling a dc motor as the primary power source to drive the bicycle and electrically wiring the motor together with a dc rechargeable battery and efficient transmission from the source to the motor. Exponential level despite that the electric bicycle is a concept that has been very feasible for years but has not been fully explored. The human electric bicycle is designed to provide electromagnetic propulsions to a bicycle therefore relieving the user of having to produce the energy required to run the bicycle. The system design is based on mechanically coupling a dc motor as the primary power source to drive the bicycle and electrically wiring the motor together with a dc rechargeable battery and efficient transmission from the source to the motor.

Key words: Pedaled, lead battery, electric vehicle (EV).

I. INTRODUCTION

To design and fabricate such an alternative system. So this project "Battery cycle" is very much useful, since it is provided with good quality of power sources and simple operating mechanism. Hence "each and every drop of fuel saves our economy and meet the needs" is the saturation point that is to be attained as soon as possible. In order to achieve this saturation point we have to save and seek for some other source of power. This power, the alternate power must be much more convenient in availability and usage. The next important reason for the search of effective, all vehicles that are in the market cause pollution and the fuel cost is also increasing day by day. In order to compensate the fluctuating fuel cost and reducing the pollution a good remedy is needed i.e., our transporting system.

Due to ignition of the hydrocarbon fuels, in the vehicle, sometime difficulties such as wear and tear may be high and more attention is needed for proper maintenance. Our vehicle is easy to handle and no fuel cost to the other existing vehicles. Hence a need for a change in the existing alternative system which can produce higher efficiency at minimum cost was thought about an attempt has been made unadulterated power are to save the surrounding environments including men, machine and material of both the existing and the next fourth generation from pollution, the cause for many harmful happenings and to reach the most talented power against the natural resource is supposed to be the electric and solar energies that best suit the automobiles. The unadulterated zero emission electrical and solar power, is only easily attainable alternate source. Hence we decided to incorporate the electric power in the field of automobile, the concept of many multinational Companies (MNC) and to get relieved from the incorrigible air pollution.

This implementation concept is tied to the best two wheeler Cycle. The various simple arrangements done for the good driving conditions of the battery powered Cycle with its most needed specifications was summarized in report.

II. WORKING PRINCIPLE

The battery cycle is two in one system. It is operating both the condition. They are, by using Normal pedaling by using Battery-motor drive Arrangement.

The working of battery-motor drive mechanism is explained below. The working principle of the system starts with the battery connections. In battery there are two terminals. One is the positive terminal and another one is the negative terminal. The wire connections were made for the flow of electrons from one part to another part. When the motor energise through the current, the stator field coil gets magnetized and induces the rotor shaft to rotate in the counter clockwise direction. At the end of the motor shaft relevant conditions were made

for the seating of sprocket assembly. Sprocket- chain arrangement is a power transmission device, which gives drive to the rear wheel.

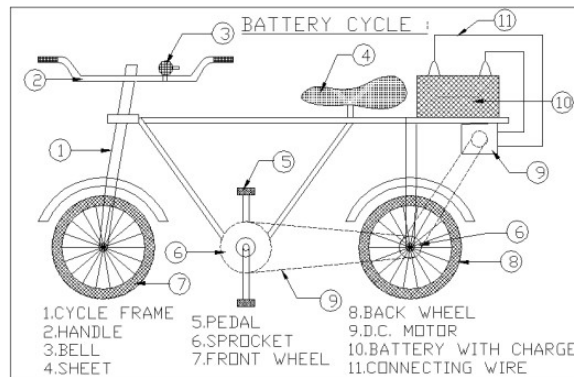


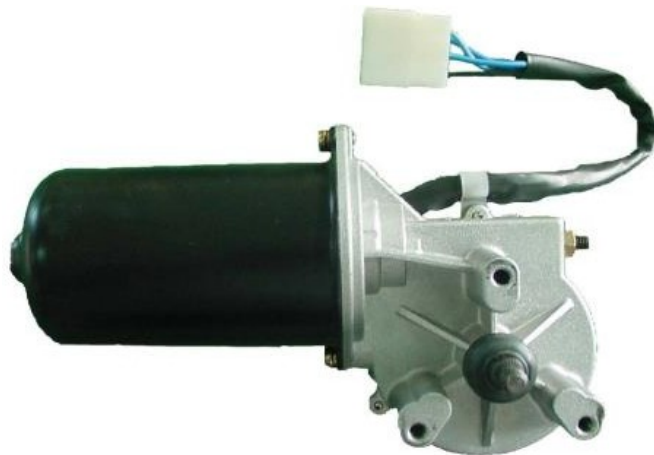
Fig 3.1 2D Model Layout

MAJOR COMPONENTS

1. D.C MOTOR
2. BATTERY
3. CHAIN DRIVE
4. CYCLE

4.1 D.C MOTOR

The electrical motor is an instrument, which converts electrical energy into mechanical energy. According to faraday's law of Electromagnetic induction, when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force whosedirection is given by Fleming's left hand rule.



Constructional a dc generator and a dc motor are identical. The same dc machine can be used as a generator or as a motor. When a generator is in operation, it is driven mechanically and develops a voltage. The voltage is capable of sending current through the load resistance. While motor action a torque is developed.

The torque can produce mechanical rotation. Motors are classified as series wound, shunt wound

motors.

SPECIFICATION

- DC Motor capacity: 12V
- Un loading :130r
- Loading : 90rpm

III.PRINCIPLES OFOPERATION

The basic principle of Motoraction lies in a sample sketch.

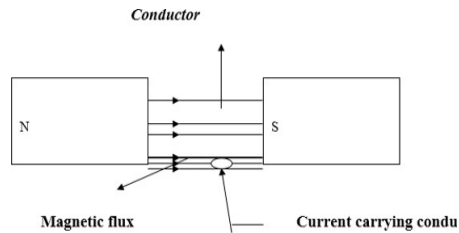


Fig 3.3 Principles of Operation

The motor run’s according to the principle of Fleming’s left hand rule. When a current carrying conductor is placed in a magnetic field is produced to move the conductor away from the magnetic field. The conductor carrying current to North and South poles is being removed .In the above stated two conditions there is no movement of the conductors. Whenever a current carrying conductor is placed in a magnetic field. The field due to the current in the conductor but opposes the main field below the conductor. As a result the flux density below the conductor. It is found that a force acts on the conductor to push the conductor downwards. If the current in the conductor is reversed, the strengthening of the flux lines occurs below the conductor, and the conductor will be pushed upward As stated above the coil side A will be forced to move downwards, whereas the coil side B will be forced to move upwards. The forces acting on the coil sides A and B will be the same coil magnitudes, but their directions will be opposite to one another. In DC machines coils are wound on the armature core, which is supported by the bearings, enhances rotation of the armature. The commutator periodically reverses the direction of current flow through the armature. Thus the armature rotates continuously.

An electric motor is all about magnets and magnetism: a motor uses magnets to create motion. If you have ever played with magnets you know about the fundamental law of all magnets: Opposites attract and likes repel.

So if you have 2 bar magnets with their ends marked north and south, then the North end of one magnet will attract the South end of the other. On the other hand, the North end of one magnet will repel the North end of the other (and similarly south will repel south). Inside an electric motor these attracting and repelling forces create rotational motion.

In the diagram above and below you can see two magnets in the motor, the armature (or rotor) is an electromagnet, while the field magnet is a permanent magnet (the field magnet could be an electromagnet as well, but in most small motors it is not to save power).

IV.BATTERY

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt.

Batteries seem to be the only technically and economically available storage means. Since both the photo-

voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern. To be economically attractive the storage of solar electricity requires a battery with a particular combination of properties



Fig 3.6 Battery

4.2.. CONSTRUCTION

Inside a lead-acid battery, the positive and negative electrodes consist of a group of plates welded to a connecting strap. The plates are immersed in the electrolyte, consisting of 8 parts of water to 3 parts of concentrated sulfuric acid. Each plate is a grid or framework, made of a lead-antimony alloy. This construction enablesthe active material, which is lead oxide, to be pasted into the grid.

Automobile batteries are usually shipped dry from the manufacturer. The electrolyte is put in at the time of installation, and then the battery is charged to from the plates. With maintenance-free batteries, little or no water need be added in normal service. Some types are sealed, except for a pressure vent, without provision for adding water.

Fig 3.7 La you of Battery

4.1

CHAIN DRIVE

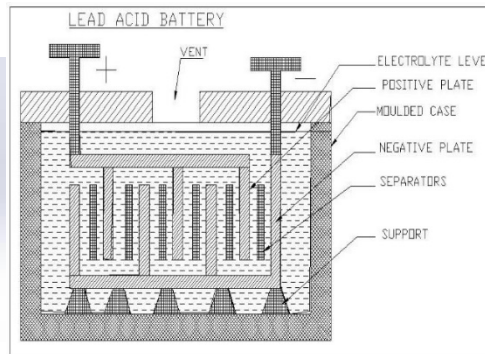
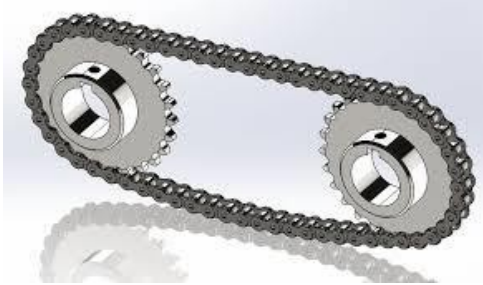


Fig 3.10 Chain drive

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycles and motorcycles. It is also used in a wide variety of machines besides vehicles. Most often, the power is conveyed by a roller chain known as the drive chain or transmission chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain. The gear is turned, and this pulls the chain putting mechanical force into the system.

Sometimes the power is output by simply rotating the chain, which can be used to lift or drag objects. In other situations, a second gear is placed and the power is recovered by attaching shafts or hubs to this gear. Though drive chains are often simple oval loops, they can also go around corners by placing more than two gears along the chain; gears that do not put power into the system or transmit it out are generally known as idler-wheels. By varying the diameter of the input and output gears with respect to each other, the gear ratio

can be altered. For example, when the bicycle pedals' gear rotate once, it causes the gear that drives the wheels to rotate more the none revolution.

4.3.1 Characteristics:

- High axial stiffness
- Low bending stiffness
- High efficiency
- Relatively



Fig 3.11 Chain Sprocket

CYCLE

A bicycle, often called a bike or cycle, is a human powered, pedal driven, single track vehicle, having two wheels attached to a frame, one behind the other. A bicycle rider is called a cyclist, or bicyclist. Bicycles were introduced in the 19th century in Europe and as of 2003, more than 1 billion have been produced worldwide, twice as many as the number of automobiles that have been produced. They are the principal means of transportation in many regions. They also provide a popular form of recreation, and have been adapted for use as children's toys, general fitness, military and police applications, courier services, and bicycle racing.

The basic shape and configuration of a typical upright or "sefty bicycle", has changed little since the first chain driven model was developed around 1885. But many details have been improved, especially since the advent of modern materials and computer aided design. These have allowed for a proliferation of specialized designs for many types of cycling.



Fig 3.16 Cycle

4.5 ADVANTAGES AND LIMITATIONS

4.1 ADVANTAGES

- No Fuel cost.

- No pollution & No fuel residue
- Easy starting
- Less wear & tear because noreciprocating parts
- Lubrication is not necessary
- It will run both the condition (Manualpedaling, battery running).

4.2 LIMITATIONS

- Battery should be charged periodically
- Not fir for long travel
- Not applicable for heavy loads untilsuitable power supply & driving unit

V.CONCLUSION

At a time when there is energy crisis casting its shadow all over the world, one has to look into alternator renewable energy sources. One such alternator way to generate power is presented in this paper. The rotating energy of the tries in the bicycle, generated by dynamo canbe used to operate small powered devices. The issues associated with electric bicycles may be addressed by custom-designed drives that are most efficient over a given operating cycle. The results of the studies listed here can serve as a platform m to improve electric bicycle performance, if new drive systems are designed around key parameters that will result in improvement of the system performance.Furthermore, they can be used for comparison of existing drives in a systematically,comprehensive, and technical way.

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