AUTOMATED BICYCLE

Swapnil Shringarpure, Pranjal Upadhyay, Abhishek Bhalotia and Dhiraj Sambhwani

ABSTRACT: The paper deals with the research and development of electric bicycles which can be implemented as an alternative to the two wheelers consuming large amount of fuel and polluting the environment. In order to cope with the lightning speed of life these days quick transportation has been one of the important factor, in one way the fast transport provide us with the modern needs of life, but on the other side the it has resulted in increased consumption of fuels and also played a crucial role in increasing pollution. This research deals with these problems efficiently as energy is generated utilizing the mechanical energy of the rider.The state of the art, general calculus and future developments are shown.

1. INTRODUCTION

This research is to implement an electric cycle powered by energy generated during pedalling to save non-renewable sources of energy that are used at an alarming rate. The pie-chart given shows a regular increase in the use of 2 wheelers, as there is a regular rise in the prices of petrol, travelling has become more and more costly as well as alarming for the mankind. The self powered electric cycle makes use of dynamo to generate electricity and motor to utilize the same.

Category	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08
Three-wheeler	231,529	284,078	307,862	359,920	403,910	364,703
Two-wheeler	4,812,126	5,364,249	6,209,765	7,052,391	7,872,334	7,248,589

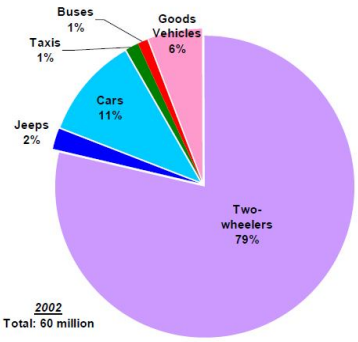

Fig 1: Pie chart depicting the use of various transports in India

2. EVALUATION OF THE STATE OF THE ART

The basic configuration of an electric bicycle consists of a control switch that controls whether the power flow is from the dynamo to battery or from battery to the electric motor. The rider of an electric bicycle can choose to

- Rely on the motor completely.
- Pedal and use the motor at the same time.
- Pedal only (use as a conventional bicycle).

Aspects Favouring the Use of Electric Bicycles

A number of aspects favour the use of electric bicycles indifferent situations. These include lower energy cost per distance travelled (1–2% of going by car when going by electric bicycle) for a single rider; savings in other costs such as insurance, licenses, registration, parking, improvement of the traffic flow; environmental friendliness; and the health benefit for the rider (Table 1).[1]

Table 1: Aspects favouring use of electric bicycles

Energy Costs	Averaging, costs* are • US$7.1/100 mi = US$4.4/100 km for going by car, but only • US$0.12/100 mi = US$0.7/100 km for going by electric bicycle.
Other Costs	Generally, no insurance, license, registration, and parking are needed.
Traffic Flow	Most states allow electric bicycles on bicycle paths; avoidance of traffic jams.
Environmental Friendliness	Zero-emission vehicle
Health Benefit	Incorporation of exercise and longer-distance commuting

2.1 BLOCK DIAGRAM

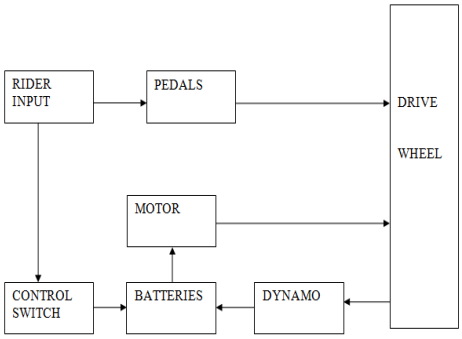

Fig 2: Block diagram

Swapnil Shringarpure , Pranjal Upadhyay, Abhishek Bhalotia and Dhiraj Sambhwani are with *Electronics Department,PVPPCOE, Emails: Shringarpureswapnil@gmail.com , pranjalup@gmail.com, abhishek.bhalotia03@gmail.com , dhiraj.sambhwani@gmail.com*

3. COMPONENTS USED

3.1 DC MOTOR WITH SPROCKET

Fig 3: DC motor with sprocket

A sprocket that is fabricated is attached to the shaft of a DC motor (12V, 100 rpm) which rotates over the chain generating electricity.

It generates a voltage of about 30V and a current of 1A at its highest speed.

3.2 PROTECTION CIRCUIT

A protection circuit or a regulator circuit containing adjustable voltage regulator IC LM 371 is used so as to protect the battery from extra charge.

3.3 CONTROLLING CIRCUIT

A circuit controlling the flow of power using switches is used. While charging the rectified power of the dynamo is stored in the batteries and so the switch between motor and batteries is OFF whereas that between dynamo and batteries is ON. When the rider is exhausted the switch for discharging is turned ON and so the batteries provide the power stored in them to the motor which has its shaft connected to the axel of the wheel. The rotation of the shaft causes rotation of the wheel.

3.3 MOTOR

Fig 4: DC motor for discharging

For discharging the motor used is a Johnson's motor (12V, 60rpm).

3.4 BATTERIES

The energy storage source of an electric bicycle is the rechargeable battery. At present, there are 4 battery chemistries that are observed in use. The Lead Acid (PbA) battery is by far the most common, while Nickel Cadmium (NiCad) is occasionally seen, and Nickel Metal-Hydride (NiMH) and Lithium Ion (Li-ion) batteries are both making headway as the choice for the future. [2]

In this paper we are considering use of Lead Acid batteries. Recharging of these storage batteries is obtained by connecting the battery terminals to a dc voltage source that has a voltage that is greater than the battery voltage. This voltage difference will cause a charging current to flow through the battery and reverse the chemical reaction that occurred during discharge. The charging current decreases as the voltage difference between the charging voltage and the battery voltage decreases. Typically, the selected charging voltage is greater than the nominal battery voltage in order to cause a slight overcharge of the battery. The battery is deemed to be "charged" when the batteries will accept no additional current.

4. GENERAL CALCULUS

4.1 Torque equation

$Torque = M \times a \times r$

Where M = mass of the cycle

a = acceleration

r = radius of wheel

4.2 Power and Torque Relation

$$Power = \frac{Torque \times 2\pi \times (rotational\ speed)}{60000}$$

5. APPLICATIONS THAT IT CAN RUN

The electric bicycle can be used for saving some amount of electricity that can be used in our day to day lives such as charging of cell phones, laptop charging and also for lighting a small led.

Fig 5: LED lightning using a dynamo

Fig 6: Laptop charging using pedalling

Fig 7: Charging of a mobile using pedalling

6. FUTURE DEVELOPMENTS

Since the research done in this paper is limited to making a prototype of electric bicycle the same can concept can be applied to a bigger cycle with taking many factors into consideration and keeping the basic logic same.

7. ACKNOWLEDGEMENTS

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