



Foldable E-Bike

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Abstract:

Nowadays, commuting from one place to another has become tedious and expensive. With the petrol and diesel prices increasing day by day, almost all the modes of transport are becoming expensive and also the space occupied by the vehicles are also a concern these days. The relevance of our project comes at this stage. Our project, the "FOLDABLE E-BIKE" is a portable electric bicycle such that it can be folded into a compact form so that it can be stored and transported easily. Since this is an e-bike there is no problem of pollution and commutation is faster than conventional cycles. The aim of our project is to give the society an efficient electric cycle that is more efficient than the current ones in concern with the space as well as the power.

Keywords: Foldable, E-Bike, Portable

I. INTRODUCTION

In the present day lifestyle man is not able to dedicate specific time for his health, importance is least given to exercise and body fitness due to time shortage and stressful life.

To cope with time deficit, we can utilize the time spent on commuting efficiently to exercise by using bicycles, thereby also contributing to pollution control.

But regular bicycles occupy sufficient space to park, are not easy to carry around and are probable to theft. Transport has been one of the most important issues to be dealt with in the present day situation as commuting from place to place within the city has become a tedious and an expensive task.

It is very difficult to reach the nearest public transport facility and in many cases the destination will be very far from the main roads where the public transport might not be able to commute or it might be very expensive.

To overcome a common problem faced by the society, an idea is conceptualized to design and fabricate a foldable bicycle.

We already have seen many foldable bicycles in the global market but the main idea of this project is to provide a foldable E- Bike which is light & sleek yet rigid & safe,

Easy to handle and easy to maintain. Unlike the conventional cycles, this bicycle will occupy very less space and also is very easy to be carried around.

The main objective is to design and develop a foldable bicycle which is comfortable to ride and economical.

II. LITERATURE REVIEW

Sagar Pardeshi, Pankaj Desle[1] explains about the design and development of effective low weight racing bicycle. Shih-Wen Hsiao, Rong-Qi Chen,

Wan-Lee Leng[4] explains the various factors to be considered while designing the frame for optimized riding posture.

III. METHODOLOGY

1. MODEL

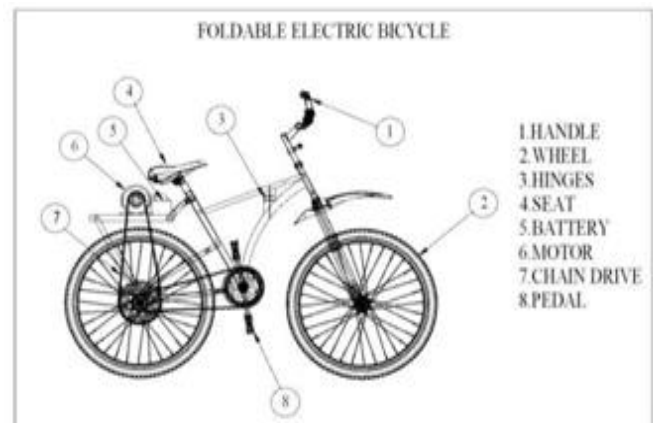


Figure.1. Model

2. METHODOLOGY

The 3 modes are:

1. Pedal only mode - like a conventional cycle Quantum cycle can be pedaled while the battery gets recharged
2. Motor only mode - by switching on the DC Motor Quantum cycle operates without pedalling
3. Hybrid mode - the pedals can also be used to gain extra torque

FOLDING

A hinge is used so that it can be folded from the mid-section and a locking mechanism is provided for storage and for portability

ADDITIONAL CHAIN DRIVE

Additional chain drive is provided which couples the DC motor and the wheel. Wider chain is used for effectively transmitting the torque transmitted by the DC motor. (Part 7 in Fig 1)

3. CALCULATIONS

Resistive force = $F_r + F_l + F_s + F_a$

(1) Where,

F_r = Rolling Resistance

F_s = Static Resistance

F_a = Air Resistance

F_r, F_a are irrelevant in case of small velocity automobiles

$$F_r = \mu \cdot W \cdot g \quad (2)$$

$$F_r = 0.16 \cdot 80 \cdot 9.81$$

= 125.568 N, which is the resistive force offered when the body is static.

Radius of Wheel, $r = 0.3$ m

$$\text{Resistive Torque} = F_r \cdot r \quad (3)$$

$$= 125.568 \cdot 0.3 = 37.67 \text{ Nm}$$

Torque offered by motor, $T = 3$ Nm

Number of teeth in driven gear, $N_1 = 50$

Number of teeth in drive gear, $N_2 = 15$

$$\text{Gear ratio, } G = \frac{N_1}{N_2} \quad (4)$$

$$= 3.33$$

$$\text{Tractive force available} = \frac{(T \cdot G)}{r} \quad (5)$$

$$= \frac{(3 \cdot 3.33)}{0.3} = 33.33 \text{ N}$$

4. COMPONENTS

- Foldable connecting link frame
- Pedal
- Sprocket
- Seat
- Wheels
- Bearing
- Chain drive
- Battery
- Dc motor
- Switch and electric wires

5. WORKING

- The Foldable E – Bike can be started by pedalling like conventional cycles
- Once sufficient moment is gained the switch on the right side of the handle can be turned ON
- This starts the motor which through the chain drive provides power to the rear wheel
- After usage the cycle can be folded by the hinge and can be locked with provided locking mechanism
- The Foldable E- Bike is now ready for storage



Figure.2. Hinge and Locking Mechanism (for unfolded condition)

IV. RESULTS AND DISCUSSION



Figure.3. Final Product

We have completed the folding part of the work. The folding of the cycle works as designed. The connection of the motor to the battery has been done and the working is checked. As there is small amount of current generation from the motor when in the pedal only model, an inverter circuit is to be connected for the effective use of the same. The FOLDABLE E-BIKE was successfully fabricated and it was concluded that it can be feasibly manufactured with minor modifications for adapting to an assembly line production.

V. CONCLUSION

- DC motor can be replaced by a hub motor which is compact and the additional chain drive can be avoided.
- Battery can be replaced by Lithium-Polymer battery which is considerably lighter than conventional batteries.
- A self designed frame aids in weight reduction and improved aesthetics

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VII. REFERENCES

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