

DESIGN AND FABRICATION OF OSCILLATION PEDAL DRIVE BICYCLE USING BEVEL GEAR MECHANISM

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Abstract- The "Oscillating bicycle with bevel gear mechanism" represents a solution to the challenges associated with conventional bicycles and manpower provided to it. New machines and technologies have been developed to produce products at cheaper rates and with high quality. We will create a machine using bevel gears to ensure quality and versatility for the bicycle industry. This article introduces a new way to reduce human effort and the bevel gear mechanism, so as to create a cheap and environmentally friendly way to reduce human effort and improve efficiency. The working mechanism, quality and design of the bevel gear Ease of operation, ecological awareness, economical use and energy efficiency for people are the main factors of this change. The limitations of existing bicycle systems have been discovered and some suggestions have been developed to improve these systems. The results show that approximately 30% of the effort can be saved for the same job.

Keywords- rotary bicycle, bevel gear arrangement, bicycle performance, pedal use, gearbox.

1. INTRODUCTION

In today's unemployment crisis, bicycles are still the only solution for ordinary people. That's why people need to look at bicycles with new interest. As we all know, in the bicycle drive system, the thigh, leg, paddle and shaft form a conical gear mechanism that enables the oscillation of the paddle. To get the best benefit from employees, the system should be optimized for maximum transmission angle and minimum transmission angle for the patient. Best time. It is also important to consider physical properties, including electrical and kinetic properties.

The development of the chain drive system gave rise to the bicycle as we know it today. Chain drive eliminates the need for the driver to drive directly over the wheel. Instead, the rider can stay between the two wheels for better balance. Recently the motorized bicycle has been developed and is slowly changing the bicycle industry. They all have unique qualities and can produce the same results. This article describes the characteristics of two drive systems (chain drive and shaft drive). After careful consideration of the two options, a conventional driveshaft was chosen for the project because its cost and flexibility were deemed suitable for the project. Shaft drives have been developed recently and only a few companies produce this type. Shaft drive uses a shaft instead of a chain to transfer power from the driver to the wheels. Usually the gear is enclosed in a casing attached to the main frame. The number of poles continues to increase according to public interest. It is slowly changing the cycling industry. New machines and modern technology have been developed to produce more products cheaper and with better quality. So we are going to make a machine for CYCLE industry using bevel gear gives mechanical advantages and make it multipurpose.

That's why we will create a machine using bevel gears that will provide quality and versatility for the bicycle industry. Shaft drives have only been created recently and only a few companies produce this type. Shaft drive uses a shaft instead of a chain to transfer power from the driver to the wheels. Usually the gear is enclosed in a casing attached to the main frame. The number of companies using cars continues to increase based on public interest. It is slowly changing the cycling industry. Engineers are constantly faced with the challenge of turning ideas and designs into reality. New machines and modern technology have been developed to produce more products cheaper and with better quality. That's why we will create a machine using bevel gears that will provide quality and versatility for the bicycle industry

This project aims to explore the design and fabrication of an oscillation bicycle utilizing a bevel gear mechanism. It offers an exciting opportunity to delve into the intricacies of mechanical engineering, gearing systems, and human-powered transportation, ultimately contributing to a more sustainable and efficient mode of travel.

In this introduction, we will provide an overview of the oscillation bicycle concept, its potential benefits, and the motivation behind its design and fabrication. Additionally, we will touch on the significance of the bevel gear mechanism as a critical component of this innovative bicycle design. This project holds promise for not only enthusiasts of cycling but also for the broader fields of engineering, sustainable transportation, and urban planning, as it represents a departure from traditional cycling and opens new avenues for exploration and development.

Objective of the Research

- To study about the difference in output received by the cycle as compared to the conventional cycle.
- Increase the efficiency of paddling by 30%.
- To improve the paddling system.
- To decrease the human efforts and increase the output.

2. LITERATURE REVIEW

In traditional bicycles we see the gear system and rowing people need to rotate 360°. We know that only 70° of this 360° rotation is used to provide power and energy to the wheel. Therefore, in this project, we replace the gear mechanism and vibration device with a bevel gear mechanism. This loop only moves at an angle of 70° where the force is generated. And it comes back the same way. This makes it 30% more efficient.

1. The review on “DESIGN, ANALYSIS & FABRICATION

OF SHAFT DRIVEN BICYCLE” was done by Dr-Rahul Vishwanath Dandage. Traditional bicycles use a chain drive to transfer power from the pedals to the tires, which needs to be perfected and improved, he said. Keep up the good work. The slightest misalignment will cause the chain to fall off. Therefore, this problem can be solved by adding a power transmitter. This project includes the design and production of bicycle frames. In this project, two spiral bevel gears were used on the pedal side and two straight bevel gears were used on the back. The driveshaft has two gears attached, one at each end. One is a spiral bevel gear at the pedal end, and the other is a straight bevel gear at the tire end.

2. Review of "Kinematics and Dynamics of Non-Circular Bicycles" by Ray Han, MA Thomlinson and Y.S. Tu demonstrates the effectiveness of riding a new bike. It features a non-marking windshield design to maximize energy efficiency. The bicycle leg is modeled as a parallel four-bar linkage on the original five-bar solid model. This parallel connection differs from the normal connection in two aspects: Its joints have time to simulate the joints of human limbs, not real pin joint bones. and one of its links has different connecting rod length attached to the crank. Rotation angle.

3. Vijayan S N's review "Evaluation of Performance of Bicycles Driven by Gear and Shaft Drive Systems" describes the advancements in internal gear technology and highlights some of the smaller versions of modern bicycles. The torque produced by the pedals and transmission needs to be sent to the rear wheels to move the vehicle forward and backward. The driveshaft must provide smooth and uninterrupted power to the axle. The driveshaft and differential are used to transmit this torque. The power range of the driveshaft is to transfer power from the transmission to the foot pedals.

4. Review on the question "Bicycles with Internal Gear Transmission Systems". Jiki Jose Malpan 1, Tom Sonny 2". Bicycles are generally designed as two-wheeled vehicles powered by riders and using handlebars to steer. This article describes the development of a new bicycle that can provide wheels of different specifications without the need for a steering wheel for a different transmission speed. The machine was then designed so that the driver was comfortable in a sitting or standing position. Then organize it. Comparison to safe cycling based on number of wheel rotations taken per pedaling cycle. While the number of revolutions per pedal stroke of an ordinary safety bicycle is considered to be 3 revolutions, the new design is 4.5 revolutions, that is, there are 1.5 revolutions. This reduces the frequency of riding and thus prevents the legs from moving quickly.

5. The Review of “Design and Fabrication of Chainless Bicycle”

K. Nagendra Reddy¹ and N. Phinandra Kumar² The chain drive shaft and bevel gear of chainless bicycle are well designed and engineered to facilitate electricity transmission. The transmission shaft reduces the weight of the shaft and the transmission torque is limited in terms of torsional buckling ability, stress and stress. The results of this study are useful in the early stages of development, saving development time and helping make better decisions about design.

6. Review on “Design and Manufacturing of Chainless Bicycle with Folding Mechanism” by Swapnil Choudhary¹ and Bharat Chede², Science Direct. This project is very beneficial for everyone because cycling is very important for health and life, it saves fuel and reduces pollution, this bicycle requires less human efforts to pedal the bicycle and is easy to carry. Compared with traditional bicycle, this cycle will be more powerful and power transmission is more.

3. REQUIRED COMPONENTS

1. Bevel gear
2. Bearings
3. Sprocket wheel
4. Free wheel
5. Flywheel
6. Solid Shaft
7. Horizontal Shaft
8. Chain drive
9. Housing
10. Wheels
11. Rim

- 12. Paddles
- 13. Chain

1. BEVEL GEAR -

Bevel gears are rotating mechanical elements used to transmit mechanical power vertically or at an angle between two intersecting lines. This mechanism uses two sizes of bevel gears.



Fig 1.1



Fig 1.2

2. BEARINGS - The bearings reduce the friction and allow the smoother rotation. This cuts down on the amount of energy consumption.



Fig 1.3

3. SPROCKET WHEEL - A sprocket is a wheel with multiple teeth that mesh with a chain or belt and act as a mechanical link. It is generally used to transmit rotational motion in machines. Gears are used in many applications such as bicycles, conveyor systems, and industrial machinery where they generate electrical conduction and control rotational speed.



Fig 1.4



Fig 1.5

4. HORIZONTAL SHAFT - A horizontal shaft is a rod used to transmit power or move horizontally. When connected to the bevel gear, it often changes the direction of movement.



Fig 1.6

5. SOLID SHAFT - It is used for riding in hilly areas. It used for riding longer distances.



Fig 1.7

6. CHAIN DRIVE-

The chain drive is an important method of transferring power from one part to another in a lawn mower. The system uses chains and gears to create a connection between the power source and the material being cut, allowing the machine to process hay or feed efficiently. The chain machine has two main components: chain and sprocket. The chain consists of a chain link that interacts with the teeth of the sprocket.



Fig 1.8

7. FREEWHEEL -



Fig 1.9

8. HOUSING- It is the assembly of bearing and shaft that is attached for the rotatory motion of connected parts.



Fig 2.0

10. WHEELS- The wheel is the most crucial element of the bicycle: it allows the rider to roll over the ground with great speed and efficiency.



Fig 2.1

11. RIM-

The rim is usually a metal extrusion that snaps against itself to form a rim, but it is also a carbon fiber structure and has historically been made of wood. Some wheels use an aerodynamic carbon steel ring attached to the aluminum ring on which conventional

bicycles are mounted.



Fig 2.2

12. PADDLE - The pedal is the part of a bicycle that the rider pushes with their feet to move the vehicle. On this bike, the oscillatory power of the paddles is reduced by 360° rotation, making it 30% more efficient.



Fig 2.3

4. MODIFICATIONS

1. The conventional cycle that is used by a common man in day to day life, is a mechanism in which the paddles rotates 360° where as in the modified bicycle, the paddles will oscillate only 70°.
2. The transmission angle of a conventional bicycle is 360° and the transmission angle of oscillation cycle is 70° resulting in consumption of more efforts in conventional cycle as compared to the oscillation cycle.
3. In the conventional cycle, the sprocket wheel along with the paddles move to and fro with the chain. When the paddles are in the reverse motion, the sprocket wheel also reverses back whereas in the oscillation cycle using bevel gear mechanism, the sprocket wheel moves only in the front and never reverses.
4. This mechanism leads to saving of the energy of a human as compared to the conventional cycle.
5. As we know, the conventional speed for a conventional cycle is 16 miles, this oscillation cycle gives more speed than 16miles.

5. RESULTS AND DISCUSSION

We know that the conventional cycle is not capable of providing drive at high speed because of its large idling time and the fact that the frequency of thigh oscillation is humanly limited. So, here we’ve implemented an oscillation cycle using bevel gear mechanism to ensure the utilization of time along with the reduction in human force. The sprocket wheel in conventional cycle moves to and fro leading to the wastage of movement, but here in oscillation cycle, the movement of paddle stays in 70°, increasing the efficiency by 30° from the conventional cycle. This mechanism will increase the speed of the cycle as compared to the normal cycle.

To be specific, here is the calculation stating the increase in the gear ratio resulting in the increase in RPM.

CONVENTIONAL CYCLE-

Calculation:

Sprocket wheel(front) teeth = 44 Sprocket wheel(rear) teeth = 18

$$\text{Gear ratio} = \frac{\text{Sprocket wheel(front) teeth}}{\text{Sprocket wheel(rear) teeth}} = \frac{44}{18} = 2.4$$

Sprocket wheel(rear) teeth

18

Due to Transmission angle of 360° the efforts induced during paddling is more.

OSCILLATING CYCLE:

Calculation:

Sprocket wheel (front) teeth = 44 Sprocket wheel (rear) teeth = 9

$$\text{Gear ratio} = \frac{\text{Sprocket wheel (front) teeth}}{\text{Sprocket wheel (rear) teeth}} = \frac{44}{9} = 4.8$$

9

Due to transmission angle of 70° , the efforts induced during paddling are less and the output as speed is more.

As we see that the rear sprocket of 9 teeth are used in oscillation cycle to increase the Gear ratio and reduce the human efforts and increase the speed.

Also, to observe in conventional cycle the reverse movement of the paddles lead to reverse in the sprocket when attached to it, whereas in the oscillation cycle, the sprocket wheel only moves forward leading to increase of the speed.

As a result, the pulse rate of the cyclist will be measured and more improvement will be induced as the speed will be increased.

6.CONCLUSION

As a conclusion, this project of Oscillating Bicycle using Bevel gear mechanism will be more convenient for people as compared to conventional bicycles due to the increase in Speed and efficiency and reduce human efforts.

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