

HUBLESS BICYCLE DESIGN WITH HANDLE BAR FOLDING MECHANISM

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ABSTRACT

Generally, in any conventional bicycle there exists a conventional chain drive system where power is transmitted from pedal to rear wheel. The conventional system have numerous disadvantages. Like the heavy maintenance, frequent lubrication. Now all this disadvantages are overcome with the help of center less drive in which the power is transmitted from pedal shaft to rear wheel with the help of spur gear drive mechanism

The rear wheel is kept larger than that of front wheel for greater speed and for comfortable drive. The design of machine height, energy expenditure while pedaling and improving smoothness are the certain design consideration in project

Keyword: - Hubless Wheel, Center less Wheel, Gear Train,

1. INTRODUCTION

Bicycle is conventional and very popular way of transport in rural and urban area. Because of low initial cost, no fuel is required to operate or run the vehicle. Non-pollutant system because of absence of fuel. In conventional chain drive system there are certain disadvantages as bellow

1. Chain drives need accurate mounting and careful maintenance.
2. Chain drive has velocity fluctuation when unduly stretched.
3. Limitation on speed ratio because maximum allowable speed for chain drives is below 1100 rpm.
4. Lower transmission efficiency which is about only 60-70 % because of polygon effect in chain drive
5. High production cost for Shimano shifter mechanism.
6. Fragile and unreliable shifter mechanism leads to continuous chain drop after certain wear.

Now this very less efficiency cause the operator cause fatigue. In conventional chain drive system sprocket head have 44 teeth and sprocket tail have 18 teeth generally. From this numbers we are getting gear ratio of 2.44 only in chain drive

1.1 Problem Solution

Thus, there is need of a drive that replaces conventional chain drive with more efficient drive like a spur gear

1. Different size wheels, rear wheel is larger than front wheel, gives more speed and comfortable ride.
2. Rear wheel drive is through a spur gear ring and spurs pinion pair. Makes system light weight and maintenance free and noiseless.
3. Drive components are fitted inside the rear Hubless wheel.
4. Arrangement of pedal system is more comfortable to drive; drive is more robust as the centre distance from drive pedal input to the Hubless wheel drive spur pinion is short to lesser transmission losses.
5. Spur gear drive efficiency is above 90% which is a known fact. Which is about 20% more than the conventional chain drive?
6. Higher speeds can be achieved using this design as there is no limitation on input speed of spur pinion. This is advantageous over chain drive, which has limitation of 1100 rpm only.



Fig -1: Assembly of Actual System

2. CONSTRUCTION

Basic Consideration is that a Driver can pedal the system with a speed of 60 rpm. Then we will design further

2.1 Spur Gear Train

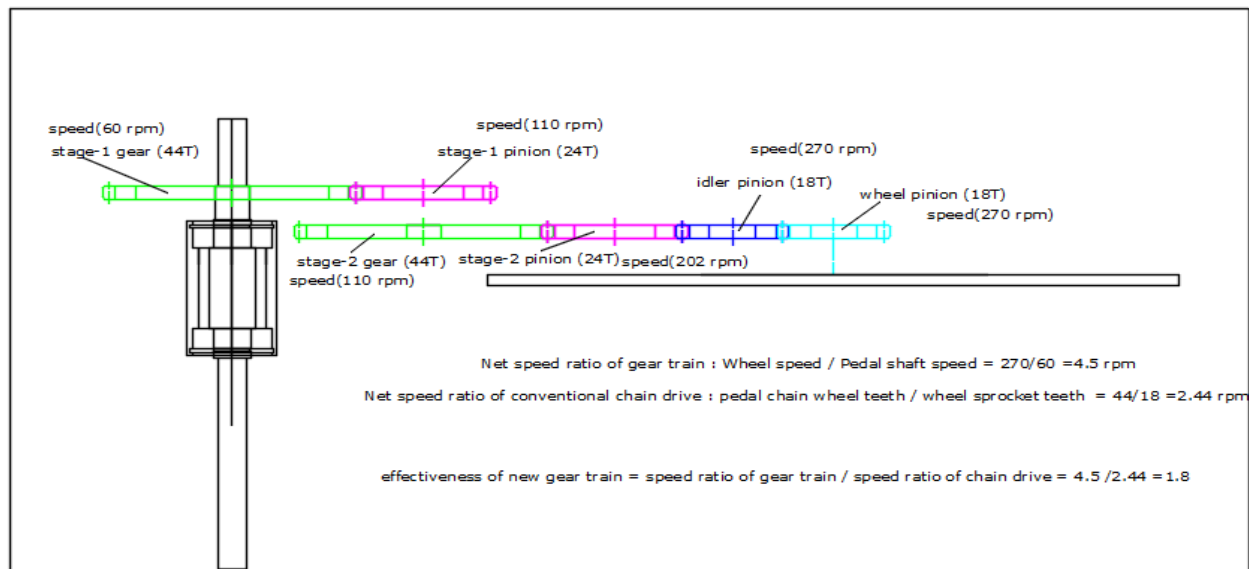


Fig -2: Spur Gear Train Mechanism

- Stage -1 gear pair is as follows:
Driver spur gear: 3 module, 44 teeth Input speed –60 rpm
Driven spur pinion: 3 module, 24 teeth Output speed –110 rpm
- Stage -2 gear pair is as follows:
Driver spur gear: 3 module, 44 teeth Input speed –110 rpm
Driven spur pinion: 3 module, 24 teeth Output speed –202 rpm
- Stage -3 gear pair is as follows:
Driver spur gear: 3 module, 24 teeth Input speed –202 rpm
Driven spur pinion: 3 module, 18 teeth Output speed –270rpm

- Stage -4 gear pair is as follows :

Driver spur gear : 3 module , 18 teeth ...Input speed –270rpm

Driven spur pinion : 3 module, 18 teeth...Output speed –270 rpm

As there is no speed change in stage 4 but it is necessary to introduce stage 4 gear also known as idler gear to change the direction of rotation. Hence we will used idler gear of 18 teeth

2.2 Front Wheel

The Front wheel is kept smaller than that of rear wheel for easy control and balancing of cycle .Small front wheel is also reduce the turning radius of bicycle.



Fig -3: Front Wheel

2.3 Pedal Shaft

The diameter of driving pedal shaft is kept 14 mm

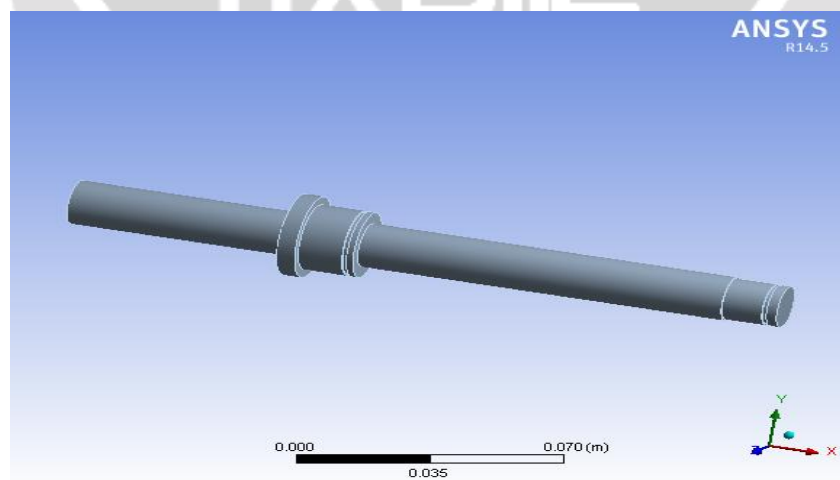


Fig -4: Pedal Shaft

2.4 Rear Hubless Wheel

The rear wheel is kept Hubless the last spur gear is giving power directly to the rim of rear wheel, through the spur gear train mechanism .



Fig -5: Hubless Wheel

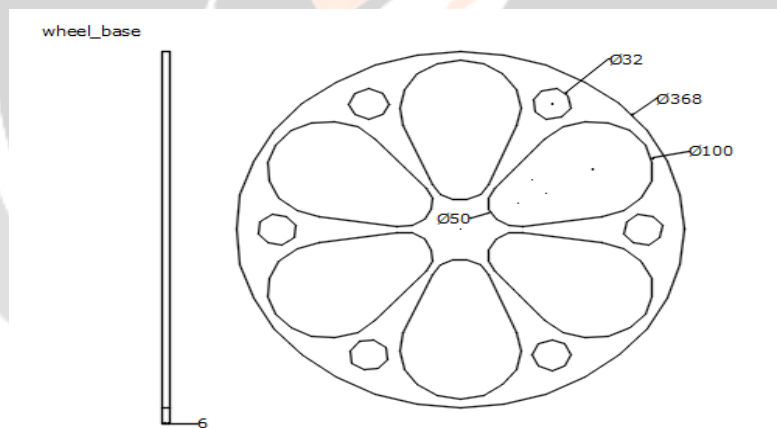


Fig -6: Template of wheel rim

3. SCOPE OF FUTURE IMPROVEMENT

Arrangement should be provided to expand the scope of work in future such as bicycle become easily foldable and transportable by providing foldable handle to the system with help of hinge.

In future, the gear may be replaced with High strength plastic or aluminium alloy to reduce the weight of the system .bicycle body may be replaced by aluminium alloy for rust free operation.

4. CONCLUSIONS

The main advantages behind this Hubless bicycle project with gear train are that the effort of operator is reduced dramatically. The output speed is increased 1.8 times that of conventional bicycle with chain drive.

1. Light weight system
2. Maintenance free operation
3. 90% efficiency of spur gear drive
4. Frequent maintenance issue is solved.
5. 1.8 times more effective system than that of conventional system

The primary results are given in following chart

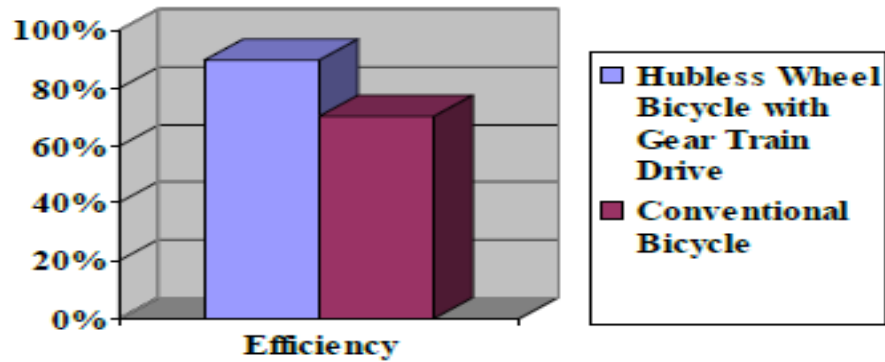


Chart-1: Efficiency result

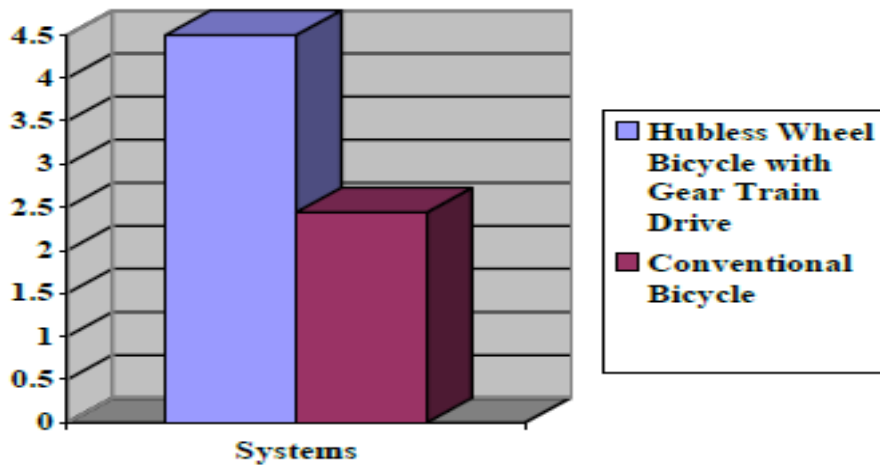


Chart-2: Gear ratio result

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