

DYNAMIC CHAINLESS BICYCLE

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Abstract

A shaft-driven bicycle is a bicycle that uses a driven shaft instead of a chain to transmit power from the pedals to the wheel. Shaft drives were introduced over a century ago, but were mostly supplanted by chain-driven bicycles due to the gear ranges possible with sprockets and derailleur. Recently, due to advancements in internal gear technology, a small number of modern shaft-driven bicycles have been introduced. The shaft drive only needs periodic lubrication using a grease gun to keep the gears running quiet and smooth. This “chainless” drive system provides smooth, quite and efficient transfer of energy from the pedals to the rear wheel. It is attractive in look compare with chain driven bicycle. It replaces the traditional method.

Keywords – Bevel Gears, Shaft drive, Dynamometer, Chainless technology, Reliable and Durable

I. INTRODUCTION

The shaft connected between the pair of spiral bevel gears. The main application of the spiral bevel gear is in a vehicle differential, where the direction of drive from the drive shaft must be turned 90 degrees to drive the wheels. The helical design produces less vibration and noise than convention straight-cut or spur-cut gear with straight teeth.

If bevel-wheels could be accurately and cheaply cut by machinery, it is possible

that gears of this description might supplant, to a great extent, the chain-drive gear: but the fact that the teeth of the bevel-wheels cannot be accurately milled is a serious obstacle to their practical success.

II. WORKING

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Aim of our Project is to make new kind of transmission system for bicycle for getting high reliability system, and more safe system. A drive shaft, driveshaft, driving shaft, propeller shaft, or Cardin shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them.

I.1 Objectives of dynamic bicycle

1. Increase durability of bicycle with the help of shaft drive.
2. Reduce maintenance cost of bicycle.
3. Increase power transmission efficiency of the bicycle.
4. Making system more reliable.
5. Reduce noise pollution using shaft drive transmission system.

III. COMPONENT OF BICYCLE



III.1 Brake lever, Grip shift, Handlebar

Brake levers are usually mounted on the handlebars within easy reach of the rider's hands. They may be distinct or integrated into the shifting mechanism. The brake lever transmits the force applied by the rider through either a mechanical or hydraulic mechanism.

Many people think that bicycle handlebars are merely the means of steering a bike, and do not give any more thought to the matter. The truth of the matter is that the handlebars are very important in determining your position on the bike.

III.2 Top tube, Down tube, Seat tube

III.2.1 Frame tubes

The diamond frame consists of two triangles, a main triangle and a paired rear triangle. The main triangle consists of the head tube, top tube, down tube and seat tube. The rear triangle consists of the seat tube, and paired chain stays and seat stays.

III.2.2 Top tube

The top tube, cross-bar, connects the top of the head tube to the top of the seat tube. Control cables are routed along mounts on the top tube, or sometimes inside the top tube. Most commonly, this includes the cable for the rear brake, but some mountain bikes and hybrid bicycles also route the front and rear derailleur cables along the top tube.

III.2.3 Down tube

The down tube connects the head tube to the bottom bracket shell. On racing bicycles and some mountain and hybrid bikes, the derailleur cables run along the down tube, or inside the down tube. On older racing bicycles, the shift levers were mounted on the down tube. On newer ones, they are mounted with the brake levers on the handlebars.

III.2.4 Seat tube

The seat tube contains the seat post of the bike, which connects to the saddle. The saddle height is adjustable by changing how far the seat post is inserted into the seat tube. On some bikes, this is achieved using a quick release lever. The seat post must be inserted at least a certain length; this is marked with a minimum insertion mark.

III.3 Pedal crank

Bicycles cranks are also known as the crank set or chain set. The cranks are part of the drive train, and as such, help convert the cyclist's energy

into the movement of the bike. The crank set consists of the crank arms, which are connected by way of the bottom bracket (axle). Chain rings are also connected to the right crank arm.

III.4 Pedal

Bicycle pedals have evolved, and now can be found in all manner of shapes and sizes. This is good news for you. It is quite easy to find the perfect pedals for you. The pedals found on most bikes are made from hard rubber or plastic. These pedals are light and durable enough for casual riding. More avid cyclists may want to consider a more durable pedal made of aluminum alloys. For those interested in maximum strength combined with minimum weight, you can always pay more for higher end bicycle pedals made of carbon or titanium.

III.5 Rear hub

A hub is the center part of a bicycle wheel. It consists of an axle, bearings and a hub shell. The hub shell typically has 2 machined metal flanges to which spokes can be attached. Hub shells can be one-piece with press-in cartridge or free bearings or, in the case of older designs, the flanges may be affixed to a separate hub shell.

Hub gears or internal-gear hubs are gear ratio changing systems commonly used on bicycles. Hub gear systems generally have a long and largely maintenance-free life though some are not suitable for high-stress use in competitions or hilly, off-road conditions.

Hub gears are sealed within the hub, which protects them from water, grit, and impacts. Thus hub gears usually require less maintenance and can be more reliable over time than comparable external derailleur gear systems, which may require more adjustments and replacement of parts (front chaining, rear cogs, narrow derailleur-chain). Hub gears provide a means for shifting gear ratios on drive trains incompatible with external derailleur such as belt drives and shaft drives.

III.6 Wheel rim

The rim of a wheel is the outer circular design of the metal on which the inside edge of the tire is mounted on vehicles such as automobiles. For example, on a bicycle wheel the rim is a large hoop attached to the outer ends of the spokes of the wheel that holds the tire and tube.

The rim is commonly a metal extrusion that is butted into itself to form a hoop, though may also be a structure of carbon fibre composite, and was historically made of wood. Some wheels use both

an aerodynamic carbon hoop bonded to an aluminium rim on which to mount conventional bicycle tires.

III.7 Tire

A bicycle tire is a tire that fits on the wheel of a bicycle, unicycle, tricycle, Quadra cycle, bicycle trailer, or trailer bike. They may also be used on wheelchairs and head cycles, especially for racing. Bicycle tires provide an important source of suspension, generate the lateral forces necessary for balancing and turning, and generate the longitudinal forces necessary for propulsion and braking. They are the second largest source, after air drag, of power consumption on a level road. The modern detachable pneumatic bicycle tire contributed to the popularity and eventual dominance of the safety bicycle.

Two main techniques for attaching a bicycle tire to a rim have developed: clincher and tubular. In an attempt to provide the best attributes of both methods, tubular clinchers have also been offered.

III.8 Brake Arm

A bicycle brake is used to slow down or stop a bicycle. There have been various types of brake used throughout history, and several are still in use today. The three main types are: rim brakes, disc brakes, and drum brakes. Caliper (or rim) bicycle brakes include side or center pull caliper brakes, and v-brakes. Although these different braking styles are slightly different, they all operate by applying braking force to the rim of the wheel via rubber brake pads.

In most cases, this is accomplished by squeezing brake levers mounted on the bicycle handlebars - thus contracting brake cables and forcing the brake pads to press against the rim. Rim brakes offer more modulation than pedal brakes, but have the tendency to lose their power in overly wet or muddy conditions.

III.9 Seat and seat post

A bicycle saddle, often called a seat, is one of three contact points on an upright bicycle, the others being the pedals and the handlebars. The bicycle saddle has been known as such since the bicycle evolved from the draisine, a forerunner of the teeth are angled; however with spiral gears the teeth are also curved.

IV.1.1 Shifting down

(to a lower gear) would result in the pedalling becoming easier (more revolutions). Pedalling at a lower resistance is perfect for steep hills, or to train your legs to move quickly.

the bicycle. It performs a similar role as a horse's saddle, not bearing all the weight of the rider as the other contact points also take some of the load.

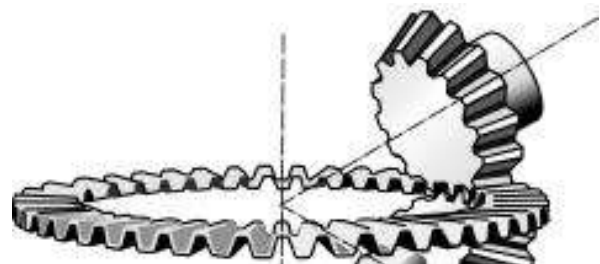
A bicycle seat post, seat pin, or saddle pole is a tube that extends upwards from the bicycle frame to the saddle. The amount that it extends out of the frame can usually be adjusted, and there is usually a mark that indicates the minimum insertion (or maximum extension). Seat posts can be made of steel, aluminium, titanium, carbon fibre, or aluminium wrapped in carbon fibre.

IV. DESIGN OF BEVEL GEAR AND DRIVE SHAFT

IV.1 BEVEL GEAR:-

Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well.

A spiral bevel gear is a bevel gear with helical teeth. The main application of this is in a vehicle differential, where the direction of drive from the drive shaft must be turned 90 degrees to drive the wheels. The purpose of gears is to transmit motion and torque from one shaft to another.



That transmission normally has to occur with a constant ratio, the lowest possible disturbances and the highest possible efficiency.

Tooth profile, length and shape are derived from those requirements. Spiral bevel gears have their teeth formed along spiral lines. They are somewhat analogous to cylindrical type helical gears in that

IV.1.2 Shifting up

(To a higher gear) would result in pedaling becoming more difficult (less revolutions). Cycling in a higher gear is ideal for flat stretches, or

downhill

stretches.



IV.2 SHAFT DRIVE:-

In a chainless bike, a drive shaft takes over the role of the chain. The pedals are connected to the drive shaft by gears, allowing the drive shaft to transfer power from the pedals to a gearbox on the rear wheel. The power from the drive shaft then spins a shaft rod that propels the rear wheel, providing the bike with power.

IV.2.1 Transmission

The drive shaft connects to a hub transmission that replaces the stacked gears found on a conventional bike. This transmission is factory-lubricated and sealed permanently. Gear changes occur inside the hub, protected from the elements. This transmission is also known as a planetary transmission, since "planet" gears cycle around a central, fixed "sun" gear. Each gear has a different number of teeth, and the various combinations of gears provide a variety of gear ratios, or speeds.



The shaft drive is a patented, lightweight and rugged aluminium alloy bevel gear drive system. This "chainless" drive system provides smooth, quiet and efficient transfer of energy from the pedals to the rear wheel. The shaft drive is designed and manufactured using the highest quality parts to last for many years.

The shaft drive is combined with a multi-speed internal rear gear hub to provide a wide range of gearing for many types of terrain – from city streets to suburban paths to mountain trails.

The bearings used in the shaft are all sealed and lubricated and do not require maintenance. The shaft rod is a solid steel rod, attached at both ends to the bevel gears. The drive shaft has served as an alternative to a chain-drive in bicycles for the past century, although never becoming very popular.



V. SHAFT DRIVEV/s CHAIN

Shaft Drive-Hub Bikes vs. Chain-Sprocket-Derailleur Bikes		
Features	Dynamic Bicycles ShaftDrive Bikes	Sprocket-Derailleur Bikes
Frame construction	Aluminium Alloy	Aluminium Alloy
Gear Components	Shimano internal Gear Hubs; Enclosed Shaft Drive	Sprockets, Derailleur's, Chains
Gear Changes	Single Shifter; Fast and seamless gear changes; shifting independent of pedaling; easy-to-read gear indicator	Multiple Shifters; must pedal to change gears; no gear indicator
Maintenance	No Scheduled Maintenance on Hub; Periodic Grease added to Shaft Drive - fast and easy	Requires adjustment of derailleur's by trained bike mechanic; periodic chain cleaning, lubrication and tensioning
Durability	Hardened cromoly gears, cast aluminium housings, sealed bearings. All moving parts fully enclosed to prevents damage and corrosion	All moving parts fully exposed and susceptible to damage, misalignment and corrosion
Resilience to Elements	Fully internal gearing sealed and protected from rain, salt, dirt, and sand	External gearing fully exposed and adversely affected by rain, salt, sand and debris
Ground Clearance (to drive system parts)	13+ inches to shaft drive	~ 8 inches to derailleur, chain and sprocket
Safety	Gears fully enclosed in shaft-drive, nothing to catch on hands or clothing; no more "chain bite"	Chain, sprockets and derailleurs can tear and soil clothing and cut hands
Efficiency	90%+ efficient (consistently with minimal maintenance)	75% - 95% efficient (varies depending on condition and upkeep)
Gear Range	8-speed = range of 21 gears of chain bike 7-speed = range of 18 gears of chain bike	21-gear or 24-gear
Noise	Low - runs virtually silent	Can vary depending on condition of chain and alignment of derailleur

VI. Advantages

- Drive system is less likely to become jammed, a common problem with chain-driven bicycles
- The rider cannot become dirtied from chain grease or injured by the chain from "Chain bite", which occurs when clothing or even a body part catches between the chain and a sprocket
- Lower maintenance than a chain system when the drive shaft is enclosed in a tube
- More consistent performance. Dynamic Bicycles claims that a drive shaft bicycle can deliver 94% efficiency, whereas a chain-driven bike can deliver anywhere from 75-97% efficiency based on condition
- Greater clearance: with the absence of a derailleur or other low-hanging machinery, the bicycle has nearly twice the ground clearance
- Another advantage that may be noticed about the chainless bike is that it protects your clothes better. Your footwear and your pants do not get accidentally damaged, and you do not have the same amount of cleaning to do. However, those who are not so crazy about this alternative type of bike say that it is enough to choose a bike with encased chain, or with chain guards, and the problem is solved.

VII. Disadvantages

- A drive shaft system weighs more than a chain system, usually 1-2 pounds heavier
- Many of the advantages claimed by drive shaft's proponents can be achieved on a chain driven bicycle, such as covering the chain and gears with a metal or plastic cover
- Use of lightweight derailleur gears with a high number of ratios is impossible, although hub
- Gears can be used
- Wheel removal can be complicated in some designs (as it is for some chain-driven bicycles with hub gears).

VIII. Conclusion

- In the beginning, chainless bikes were less efficient than standard bikes, but the changes in technology allowed them to reach a level of efficiency that made them practical for day by day use.
- The fact that the internal gears are protected against any kind of damage, dirt, or debris, makes these bikes quite a viable alternative. Keep in mind that a shaft drive bicycle may not be as efficient as a good quality well maintained classic model, but it still has its fair share of advantages.

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