Power Magnification By Chain Drive

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Abstract

A bicycle includes a speed-increasing mechanism interposed between the driving sprocket and the driven sprocket. The speed-increasing mechanism includes a small intermediate sprocket mounted rotatably on the frame of the bicycle, a first chain trained on the driving sprocket and the small intermediate sprocket, a large intermediate sprocket connected securely and coaxially to the small intermediate sprocket, and a second chain trained on the large intermediate sprocket and the driven sprocket. The radius of the small intermediate sprocket is smaller than that of the driving sprocket, while the radius of the large intermediate sprocket is greater than that of the driven sprocket. In one embodiment, the frame includes a generally U-shaped bracket having two symmetrical, parallel, upright side walls each of which has a notch cut formed in the upper end thereof, a shaft positioned between the side walls of the bracket, two three add holes respectively formed in two end surfaces thereof, and two lock bolts respectively extending through the notches cut of the bracket to engage with the threaded holes of the shaft so as to retain the shaft on the bracket. The large and small intermediate sprockets on same hub are journalled on the shaft.

Keywords: Sprocket, Chain, Shaft, Teeth, Torque, Speed

I. INTRODUCTION

Chain Drive is Power Transmitting Device From Long Time.
Chains can be used to perform three basic functions in Automobile , Machine & Industries as below

(1) Transmitting power
(2) Conveying materials
(3) Timing purposes

A. Bicycle

– Ordinary Bicycle

The first ordinary bicycle was built around 1971 the last in 1892. In these twenty years, the highwheel developed from a heavy and dangerous thing, into a fast bicycle, which even today is a very pleasant ride.
After the safety bicycle was introduced, around 1885, these highwheels were called 'ordinary bicycle', strange as it may seem nowadays. Later they were nicknamed penny farthing, which is now a common name for these fantastic bikes. They were made in the periode 1870-1892.

– Gear bicycle

Ever since bicycles came with more than one sprocket on the front and back, they were usually referred to as the number of gear combinations that were offered. For example, a road bike with two chain rings up front and a five-speed freewheel on the back was a "10 speed" since the five rear sprockets could be matched with either of the two front chain rings.

II. LITERATURE REVIEW

Glenn F. Read. A power drive unit for driving a utilization mechanism such as, for example, a roadwheel of a light vehicle such as a bicycle, tricycle, or quadricycle. The utilization mechanism is driven from the output shaft of a prime mover mounted through a controllable clutch and chain drive train. Preferably, the prime mover is an internal combustion engine driven chain saw from which the saw chain and chain bar have beem removed and replaced by an adapter providing a chain and belt drive

from the chain saw engine output shaft to a chainwheel coupled to the utilization mechanism, for example, a bicycle conventional chainwheel such as to drive the bicycle rear wheel through the conventional multispeed hub or multispeed sprocket cluster, or alternatively, to drive the front wheel of a bicycle through a chainwheel coupled to the front wheel hub, the front wheel hub being preferably a multi-speed hub with internal gears.

Nile E. Sawmiller, Craig S. Sawmiller. The invention relates to an improved pedal drive mechanism for a bicycle. The mechanism provides a vertically oval pedal path which provides an improvement in the thrust imparted to the driving wheel during the downward movement of the pedal. These paths are defined by two sets of sprockets disposed in parallel planes connected by a set of double strand chains. This mechanism is connected to the drive wheel by a conventional sprocket-chain linkage.

James S. Busby, Costa Mesa, Calif. A direct drive bicycle comprising a main frame. Rotatably mounted within the main frame is a variable rate transmission unit having rotatable input and output shaft. Rotatably connected to the main frame is chain wheel. The chain wheel is mechanically coupled to the input shaft of the transmission unit in a manner wherein rotation of the chain wheel facilitates the rotation of input shaft.

Patrick E. Turner; Lawrence K.O'Dell, A drive mechanism is disclosed that is selectably engageable to provide a bicycle that has normally driven and nondriven wheels with either single or dual wheel drive. The drive mechanism includes a power take ofT means that has: a first power transmission mechanism mounted on said frame; a second power transmission mechanism mounted on the bicycle frame in positive drive power transmitting engagement with a normally non-driven wheel of the bicycle; and a power transfer apparatus connected to receive power from the first power transmission mechanism and transmit it to the second power transmission mechanism. A coupling mechanism is operatively connected with the power take ofT and is selectively actuatable to place the first power transmission mechanism either in a drive position receiving power from the normally driven wheel or a disengaged non-power transmitting position. An actuator mechanism is mounted on the bicycle to selectively move the coupling mechanism either to the disengaged position or to the drive position to energize the power transfer apparatus and drive the normally nondriven wheel.

III. METHODOLOGY

- Modify/Rearrange the chain and sprocket mechanism for the power magnification.
- Four different sprockets, 2 chain, and 3 rotating shafts has been used.
- Here the driving shaft is connect with the driven shaft through intermediate shaft
- There is the provision of two different size sprockets on the intermediate shaft.
- Driving sprocket is connects with the small size sprocket which on the intermediate shaft.
- Driven sprocket is connects with the large size sprocket which on the intermediate shaft.
- When we press the paddle the power transmitted from driving sprocket to the small size sprocket of intermediate shaft.
- Both sprockets are mounted on intermediate shaft.
- So that speed of the both sprocket is same.
- The big sprocket of intermediate shaft is transmitted power to the driven shaft by chain.

IV. PARTS

(1) Roller Bearing
(2) Roller chain
(3) Sprocket
(4) Shaft
(5) Free Wheel

V. OPERATIONS

A. Turning of shaft:

Turning is the machining process in which a cutting tool, typically a non-rotary tool bit, describes a helical tool path by moving more or less linearly while the workpiece rotates. In this operation reduce the diameter of the shaft. The tool's axes of movement may be literally a straight line, or they may be along some set of curves or angles, but they are essentially linear

B. Cutting of the pipe:

Pipe cutting, or pipe profiling, is a mechanized industrial process that removes material from pipe or tube to create a desired profile. Typical profiles include straight cuts, mitres, saddles and midsection holes. These complex cuts are usually required to allow a tight fit between two parts that are to be joined via arc welding.

C. Surface Finishing & Fitting of bearing and shaft by Pressing of pipe:

Pipe pressing used to apply a large, circumferential compressive force to quickly create liquid-tight connections in metal and plastic fluid-handling systems. A large force is applied in a short burst, with 360-degree or close contact to the outer diameter of the deformable target material, and a crimping action is made by the pipe and hose pressing tool. The deformable material is usually a metal, like copper, that holds its shape and provides a residual compressive force to create the liquid-tight connection.

D. Welding:

Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melting the workpieces and adding a filler material to form a pool of molten material that cools to become a strong joint with pressure sometimes used in conjunction with heat, or by itself, to produce the weld. In this operation, fix the sprocket on the shaft

VI. RESULT ANALYSIS

A. Calculation for Front & small intermediate sprocket

Calculation:

$$Gear\ Ratio\ = \frac{\text{Small intermidiate sprocket teeth}}{\text{Front sprocket teeth}}$$

If we are using 44 teeth on the front sprocket and 18 teeth on small intermediate sprocket than we obtain gear ratio is 0.409.

Table - I

SR NO.	*FRONT SPROCKET (rpm)*	*FRONT SPROCKET (teeth)*	*SMALL INTERMIDI-ATE SPROCKET (teeth)*	*CHAIN LENGTH*	*CHAIN PITCH (inch)*	*AXLE RPM*	*GEAR RATIO*
1.	*40*	*48*	*16*	*46.37*	*0.5*	*120*	*0.33*
2.	*40*	*48*	*18*	*52.89*	*0.5*	*106.7*	*0.37*
3.	*40*	*44*	*16*	*51.34*	*0.5*	*110*	*0.36*

B. Calculation of Big intermediate sprocket to Rear sprocket

Calculation :

$$Gear\ Ratio\ = \frac{\text{Rear sprocket teeth}}{\text{Big intermeadite sprocket teeth}}$$

If we are using 28 theeth on intermediate sprocket to 18 teeth on rear wheel sprocket than we obtain gear ratio is 0.642

Table - II

SR NO.	*SMALL INTERMID-ATE SPROCKET (rpm)*	*BIG INTERMIDI-ATE SPROCKET (teeth)*	*REAR SPROCKET (teeth)*	*CHAIN LENGTH*	*CHAIN PITCH (inch)*	*AXLE RPM*	*GEAR RATIO*
1.	*120*	*28*	*16*	*55.11*	*0.5*	*210*	*0.57*
2.	*106*	*28*	*14*	*54.93*	*0.5*	*200*	*0.50*

3(a).	*110*	*26*	*18*	*51.07*	*0.5*	*158.89*	*0.69*
3(b).	*110*	*26*	*14*	*54.12*	*0.5*	*204.29*	*0.53*

VII. CONCLUSION

In this report there are use a different mechanism for the increase the speed of the bicycle. First large sprocket attached on the pedal shaft and it was connected to the small sprocket of the intermediate sprocket mechanism and intermediate shaft consist a large sprocket.

Large sprocket of the intermediate shaft connected to the driven shaft sprocket. Due to the high gear ratio there are increase the speed of the driven shaft. Increase the torque by using of the invert mechanism. This mechanism is very cost effective and will be easily apply on the conventional bicycle.

VIII. FUTURE SCOPE

- This Mechanism can be used in conventional 3 & 4 wheeler vehicles.
- By using this type of mechanism, we can improve the speed of using of racing bicycles and can have other application.
- Can be used for electricity generation. (small amount of power)
- It Can be also use in running the water pump, washing machine etc. without electricity or fuel. (Mechanical Power)

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