

RETRO DIRECTION BICYCLE

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Abstract:- Retro-direct is a gearing mechanism used on some bicycles in the early 20th century, which provides a second gear ratio when pedaled backwards. Retro-direct was developed by French inventor Paul de Martin de Viviés (1833–1911). An early two-chain version was patented by in 1869 by Barberon and Meunier. A single-chain version was patented in 1903 by the bicycle manufacturer Hironde. Some hobbyists have converted modern bicycles to use retro-direct gearing. A bicycle, also called a cycle or bike, is a human-powered, pedal-driven, single-track vehicle, having two wheels attached to a frame, one behind the other. A bicycle rider is called a cyclist, or bicyclist. Bicycles were introduced in the late 19th century in Europe, and by the early 21st century, more than 1 billion have been produced worldwide. These numbers far exceed the number of cars, both in total and ranked by the number of individual models produced they are the principal means of transportation in many regions. They also provide a popular form of recreation, and have been adapted for use as children's toys, general fitness, military and police applications, courier services, bicycle racing and bicycle stunts.

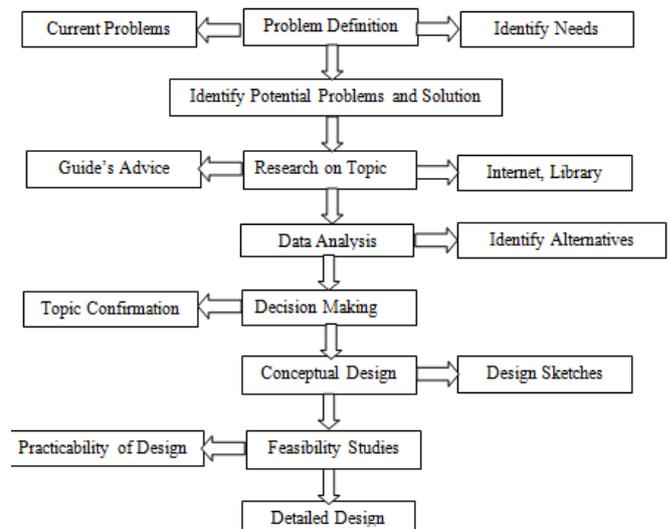
KeyWords: Shaft, Sprocket, Bearing, Frame, Chain, Wheel.

LITERATURE REVIEW

- Retro-direct was developed by French inventor Paul de Martin de Viviés (1833–1911). An early two-chain version was patented by in 1869 by Barberon and Meunier. A single-chain version was patented in 1903 by the bicycle manufacturer Hironde. Some hobbyists have converted modern bicycles to use retro-direct gearing.
- Alley & McLellan of Glasgow studied was being incorporated into truck mounted dump bodies relatively early on, in which record shows one of the first hydraulic dump bodies was the Robertson Steam Wagon with a hydraulic hoist that received power from the truck's engine or an independent steam engine was developed another early hydraulic dump body in 1907 that was power-driven by steam.
- Ganesh Shinde et al studied the Modern which has been conceived by observing the difficulty in unloading the materials. The survey in this regards in several automobile garages, revealed the facts that mostly some difficult methods were adopted in

unloading the materials from the trailer. They have mainly focused on above difficulty. Hence a prototype of suitable arrangement has been designed. The vehicles can be unloaded from the trailer in three axes without application of any impact force. The Direction control valve which activates the ram of the hydraulic cylinder which lifting the trailer cabin in require side. Further modifications and working limitations will put this work in.

PROCEDURE/ METHODOLOGY

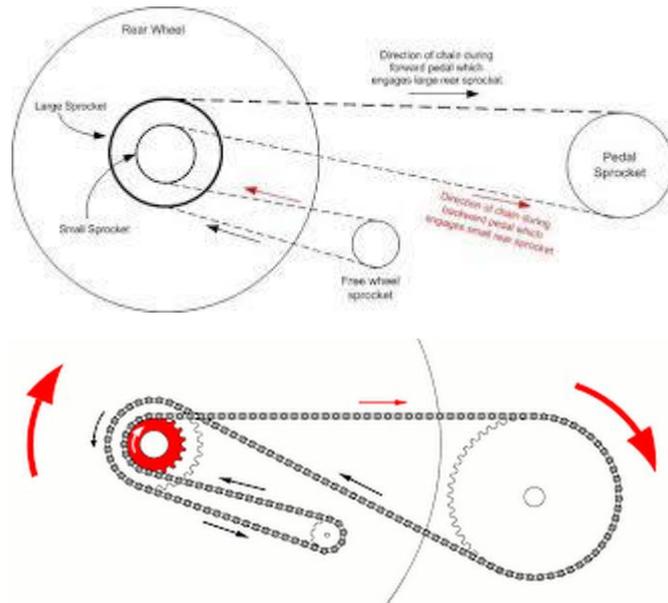


WORKING PRINCIPLE

In the single-chain system, the chain runs from the top of a chainging attached to the cranks to the top of a sprocket attached to the rear wheel hub with a freewheel , as with most bicycle chain drives. The chain then, usually, wraps around the rear sprocket to an idler sprocket between the rear wheel and the cranks, then runs back to a second sprocket attached to the rear wheel with a second freewheel, and finally returns to the bottom of the chain ring. Other configurations are possible, including one chain for forward pedaling, and a second crossed-chain configuration for reverse pedaling. Only one freewheel is engaged at a time, while the other spins backward freely. Since the chain wraps around the second sprocket in the opposite direction to the first sprocket, the cyclist needs only to pedal backwards to engage it. The small amount of out-of-line required of the

chain is easily accommodated. The rear wheel cannot rotate backwards because the two freewheels try to drive the pedals forward and backward at the same time.

Usually the second sprocket is larger, which provides the cyclist a lower gear for climbing steep inclines simply by pedaling backwards. While most historical examples of retro-direct bicycles used the reverse gear for climbing, several modern retro-direct riders prefer pedaling forward when standing to accelerate from rest and climb, and engaging the higher cruising gear while pedaling backwards.



COMPONENTS AND DESCRIPTION

The major parts **retro direction bicycle** are described below

1. Shaft
2. Sprocket
3. Chain
4. Bearing
5. Wheel.
6. Frame.

Shaft :-

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power. An axle is a central shaft for a rotating wheel or gear. The shaft may be hollow or solid. The shaft is supported on bearings and it rotates a set of gears or pulleys for the purpose of power transmission. The shaft is generally acted upon by bending moment, torsion and axial force. Design of shaft primarily involves in determining stresses at critical point in the shaft that is arising due to aforementioned loading. Other two similar forms of a shaft are axle and spindle.

Standard sizes of Shafts:-

Typical sizes of solid shaft that are available in the market are:

- Up to 25 mm 0.5 mm increments
- 25 to 50 mm 1.0 mm increments
- 50 to 100 mm 2.0 mm increments
- 100 to 200 mm 5.0 mm increments

Shafts Materials:-

The ferrous, non-ferrous materials and non metals are used as shaft material depending on the application. Some of the common ferrous materials used for shaft are discussed below.

Hot-rolled plain carbon steel:

These materials are least expensive. Since it is hot rolled, scaling is always present on the surface and machining is required to make the surface smooth.

Cold-drawn plain carbon/alloy composition:

Since it is cold drawn it has got its inherent characteristics of smooth bright finish. Amount of machining therefore is minimal. Better yield strength is also obtained. This is widely used for general purpose transmission shaft.

Alloy steels

Alloy steel as one can understand is a mixture of various elements with the parent steel to improve certain physical properties. To retain the total advantage of alloying materials one requires heat treatment of the machine components after it has been manufactured. Nickel, chromium and vanadium are some of the common alloying materials. However, alloy steel is expensive. These materials are used for relatively severe service conditions. When the situation demands great strength then alloy steels are used. They have fewer tendencies to crack, warp or distort in heat treatment. Residual stresses are also less compared to CS(Carbon Steel). In certain cases the shaft needs to be wear resistant, and then more attention has to be paid to make the surface of the shaft to be wear resistant. The common types of surface hardening methods are:

Hardening of surface

Case hardening and carburizing.

Cyaniding and nitriding.

Shaft loads:-

- Torsion due to transmitted torque
- Bending from transverse loads (gears, sprockets, etc.)

Steady transverse-bending load, fully reversing bending stress (fatigue failure)

Shaft Stresses:-

Bending Stresses: Bending stress is the normal stress that is induced at a point in a body subjected to loads that cause it to bend. Torsional Shear Stresses:

Sprocket:-

A sprocket or sprocket-wheel is profiled wheel with teeth, cogs, or even sprockets that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it differs from a pulley in that sprockets have teeth and pulleys are smooth.



Figure: Sprocket

Sprockets used in bicycles, motorcycles, cars, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel. Early automobiles were also largely driven by sprocket and chain mechanism, a practice largely copied from bicycles. Sprockets are of various designs, a maximum of efficiency being claimed for each by its originator. Sprockets typically do not have a flange. Some sprockets used with timing belts have flanges to keep the timing belt centered. Sprockets and chains are also used for power transmission from one shaft to another where slippage is not admissible, sprocket chains being used instead of belts or ropes and sprocket-wheels instead of pulleys. They can be run at high speed and some forms of chain are so constructed as to be noiseless even at high speed.

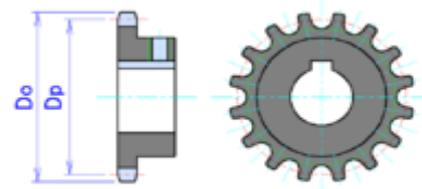


Figure: tooth sprocket. Do = Sprocket diameter. Dp = Pitch diameter

The tooth form of a sprocket is derived from the geometric path described by the chain roller as it moves through the pitch line, and pitch circle for a given sprocket and chain pitch. The shape of the tooth form is mathematically related to the Chain Pitch (P), the Number of Teeth on the Sprocket (N), and the Diameter of the Roller (Dr). The formulas for the seating curve, radius R and the topping curve radius F include the clearances necessary to allow smooth engagement between the chain rollers and sprocket teeth.

There are four types of sprocket:

- Type A: Plain plate sprocket.
- Type B: Hub on one side
- Type C: Hub on both sides
- Type C: Detachable hub

6.3 : Chain:-

Roller chain or bush roller chain is the type of chain drive most commonly used for transmission of mechanical power on many kinds of domestic, industrial and agricultural machinery, including conveyors, cars, motorcycles, and bicycles. It consists of a series of short cylindrical rollers held together by side links. It is driven by a toothed wheel called a sprocket. It is a simple, reliable, and efficient means of power transmission.



Chain Construction:-

There are actually two types of links alternating in the bush roller chain. The first type is inner links, having two inner plates held together by two sleeves or bushings upon which rotate two rollers. Inner links alternate with the

second type, the outer links, consisting of two outer plates held together by pins passing through the bushings of the inner links. The "bushing less" roller chain is similar in operation though not in construction; instead of separate bushings or sleeves holding the inner plates together, the plate has a tube stamped into it protruding from the hole which serves the same purpose. This has the advantage of removing one step in assembly of the chain.

The roller chain design reduces friction compared to simpler designs, resulting in higher efficiency and less wear. The original power transmission chain varieties lacked rollers and bushings, with both the inner and outer plates held by pins which directly contacted the sprocket teeth; however this configuration exhibited extremely rapid wear of both the sprocket teeth, and the plates where they pivoted on the pins. This problem was partially solved by the development of bushed chains, with the pins holding the outer plates passing through bushings or sleeves connecting the inner plates. This distributed the wear over a greater area; however the teeth of the sprockets still wore more rapidly than is desirable, from the sliding friction against the bushings. The addition of rollers surrounding the bushing sleeves of the chain and provided rolling contact with the teeth of the sprockets resulting in excellent resistance to wear of both sprockets and chain as well.

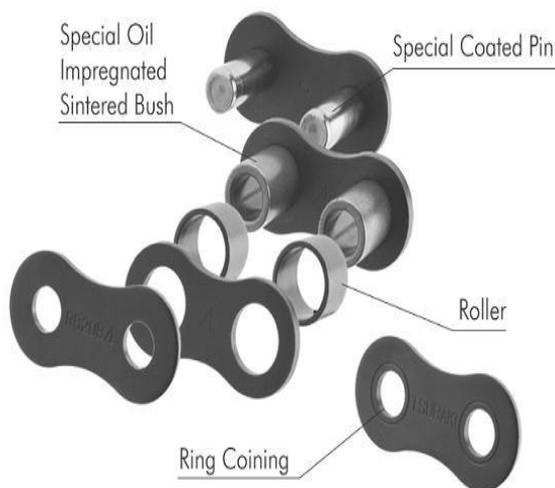


Figure. Chain Parts

Chain Dimensions:-

Chain types are identified by number; I.e. a number 40 chain. The rightmost digit is 0 for chain of the standard dimensions; 1 for lightweight chain. The digits to the left indicate the pitch of the chain in eighths of an inch. e.g. a number 40 chain would have a pitch of four-eighths of an inch, or $1/2''$, and would be of the standard dimensions in width, roller diameter, etc.

The roller diameter is "nearest binary fraction" (32'nd of an inch) to $5/8$ ths of the pitch; pin diameter is half of roller

diameter. The width of the chain, for "standard" (0 series) chain, is the nearest binary fraction to $5/8$ ths of the pitch; for narrow chains (1 series) width is 41% of the pitch. Sprocket thickness is approximately 85-90% of the roller width.

Plate thickness is $1/8$ th of the pitch, except "extra heavy" chain, which is designated by the suffix H, and is $1/32''$ thicker.

Advantages

1. Small size and simple in construction.
2. Easy to operate, not much skill is required to operate the machine, i.e. skilled operator is not required.
3. Less time of operation.
4. Low cost.
5. Less maintenance.
6. High accuracy of operation.

REFERENCES

1. Ganesh Shinde, Prachi Taweale, and Laukik Raut, Design and Development of 3- Way Dropping Dumper, International Journal of Emerging Technology and Advanced Engineering, 4(9), 2014, 2250-2459.
2. Amboji Sudhakar R., Humane Yogesh A., Chavan Rohan R., Patil Jyotsna C., and Kshirsagar Prashant R., Design and Fabrication of Three Way Tipper Mechanism, International Journal of Research in Advent Technology, 2(4), 2014, 2321-9637.
3. R.K. Bansal, Pascal, A Text Book of Fluid Mechanics and Machinery, Laxmi Publications, New Delhi, 2000.
4. R.S. Khurmi, J.K. Gupta, 14th Edition. Machine Design, S. Chand & Company Ltd., New Delhi, 2000.
5. R.S. Khurmi, J.K. Gupta, Theory of machines, S. Chand & Company Ltd., New Delhi, 2008.