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Design And Fabrication of Hubless Wheel in Moped

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Abstract*: The principle reason for hub less wheel with apparatus drive component is configuration to change over the human muscle control through hawking(peddling) work into the mechanical work. In earlier year back power is transmitted through chain drive from sell to raise wheel. Hawk and shafts are accepting the human endeavors and convert it into rotational movement. This rotational movement is transmit up to the driving wheel through the goad gear drive train. In this paper we satisfy the chainless transmission to the vehicle to defeat the different inconveniences of chain drive and increment the recurrence of vehicle. The plan means to consolidate advantage of both wheel sizes for the parity of speed, estimate. This system has capacity to lessen the weakness on vehicle rider by improving the power transmission effectiveness. The general technique of structuring of hub less wheel vehicle for quality thought is talked about in this paper.*

Keywords*: Hubless wheel, spoke less wheel, spur gear, gear train, Center less wheel*

I- INTRODUCTION

Today India is the second biggest nation on the planet as indicated by the population. India is the large market for all kinds of vehicles but to till vast quantities of individuals are deprived from the good transportation system. There are huge quantities of resident are situated in rural area where modern transportation offices are not useful due to poor condition of roads and their networks. Today's the cost of fuels is also increases rapidly there are several pollutants are emitted into atmosphere by those fossil fuel operated vehicle and day to day these problem becomes very critical. So we have to need of the transportation vehicle which can provide service without the consumption of non-renewable energy sources to keep the discharge of poisons.

There are difference kinds of vehicles available to provide service to customers, but there is need to give an alternative to conventional vehicle to overcome different drawbacks ,to overcome this drawback and to improve the quality of service hub less wheel vehicle was designed. The hub less wheel was designed by Franco Sbarro (Who has fabricated a verity of working hub less wheel vehicle ,counting at any rate to engine cycle and a vehicle ,the 1989 Sbarro Osmos),And protected by Globeholding of Geneva .The idea of the hub less wheel (A.K.A. Center less wheel) is a wheel with no inside .

I. OBJECTIVES

The hub less vehicle with gear train mechanism will fulfill the following objectives.

- Transmission of power through high efficient drive mechanism.
- Decrease system weight.
- Maximum Gear train effectiveness.
- High load carrying capacity.
- Environmental friendly.

II. METHODOLOGY

Design consists of applications of scientific principles and technical information for invention of new mechanism to perform specific function with more efficiency and less cost. The plan philosophy relies upon two kinds;

- System Design.
- Mechanical Design.

The course of our work start with arranging stage including introductory research, writing review and foundation examine. The fundamental thought is to transmit control by interfacing the hawk rigging to the pinion which networks with the back wheel having outside or inside apparatuses. It is trailed by idea age stage that incorporates assessing existing hubless wheel, client prerequisite and idea plan. Prototyping the hubess wheel into the moped or cycle using the apparatus drive

mechanism and we progress toward testing efficiency. Collection of all equipment and material required for overall fabrication of hub less wheel setup for more efficient and light weight.

III. CONSTRUCTION

Basic idea of construction is that a driver can drive the vehicle with maximum efficiency.
The following components are used to construct the system.

A. Spur Gear:

The goad gear is most normal kind of rigging. They have straight teeth, and are mounted on parallel shaft.

B. Pedal Shaft:

It comprises of at least one sprockets, attested to the crank to which the pedal attached. The rider power will transmitted into rotational mechanism through pedal shaft.

C. Front Wheel:

Size of Rear wheel is slightly large as compare to front wheel. Due to small size it is easy to balancing, controlling and reduces the turning distance of the vehicle.

D. Rear Wheel: Rear wheel is taking as a hub less, and the power will transmitted through pedal and spur gear and it convert into rotational motion.

E. Ball Bearing: A metal roller is a moving component bearing. That utilization to keep up the hole between the two moving parts.

IV. WORKING PRINCIPLE

The fundamental reason for this framework is to convert human efforts into rotational motion. The hub less system is working on human muscle power, to produce a torque on shaft. The rider connected power on pedals; shaft has capacity to pick the torque and changed over into rotational movement. This rotational power provided up to driving wheel. In this framework goad apparatus and pinion is utilized to supplant the chain drive framework. As indicated by the span of wheel the quantity of teeth on rigging is chosen. The quantity of teeth on goad gear is more than pinion to transmit the power. The general rigging proportion delivered by this instrument is about 4:5. Along these lines framework can change over the better effectiveness. Because of this sort of framework the capacities to diminish the weariness on bike rider by improving force transmission proficiency.

Fig.(1):-Fabrication of Hubless Wheel.

V. CALCULATION

1. Design of chain drive:-

N_1=140 rpm

T=F×L=250×0.35

T=87.5 N-m

$$P_R=\frac{2\pi N_1 T}{60}=\frac{2\pi\times140\times87.5}{60}$$

P_R=1283 Watts

(a) Design power:- $P_d=P_R\times K_l$
Assuming, 24 hrs/day service with moderate shock.

K_l=1.4

P_d=1283×1.4

P_d=1796 Watts

But in P_d, 1 HP=746 Watts

$$P_d=\frac{1796}{746}$$

P_d=2.4 HP

(b) Selection of Chain Number:-
For P_d=2.4 HP & N_1=140 rpm

(I) Selecting chain no.=60

$\therefore$ Pitch=18.75 & no. Of tooth on Sprocket, T_1=27

* $Dp_1=\frac{P}{\sin(180/T_1)}=\frac{18.75}{\sin(180/27)}$ =162 mm

*$V_A=\frac{Dp_1\times\pi\times N_1}{1000}=\frac{162\times\pi\times140}{1000}$ =71 m/min

(c) By Centre distance:- $C=Dp_2+1/2Dp_1$

$150=Dp_2+1/2\times162$

Dp_2=70 mm

$Dp_2=\frac{P}{\sin(180/T_2)}$, $70=\frac{18.75}{\sin(180/T_2)}$,

T_2=11

$\frac{N_2}{N_1}=\frac{T_1}{T_2}$, $\frac{N_2}{140}=\frac{27}{11}$, N_2=345 rpm

$Vp_2=\frac{\pi\times Dp_2\times N_2}{1000}=$

$\frac{\pi\times70\times345}{1000}=75m/\min$

2. Design of Spur Gear:-

P_R = 1283 Watts

N_p = 345 rpm

(a) Design Power:- $P_d=P_R\times K_l$

Considering 24hrs/day service with medium shock.

K_l=1.8

P_d=1283×1.8

P_d=2309 Watts

(b) Static condition :- $F_t \le F_B$

(I) Tangential tooth load (F_t):- $\frac{P_d}{V_p}$

$V_p=\frac{\pi\times D_p\times N_p}{1000\times60}$

But, D_p=70 mm

For good balance in Strength and wear for hard steel

t_p=25

$\therefore V_p=\frac{\pi\times70\times345}{1000\times60}$

V_p=1.26 m/s

$F_t=\frac{P_d}{V_p}=\frac{2309}{1.26}$

$F_t=1.83\times10^3$ N

(II) Bending Strength (F_B):- $S_o\times C_v\times b\times Y\times m$

Considering SAE 1045 heat treated steel as the material of pinion & gear both.

S_{op}=245 mpa

S_{og}=245 mpa

Let, C_v=0.4

b=10×m

Now, Modified lewis factors

$Y_p=$

$0.485-\frac{2.87}{t_p}=0.485-\frac{2.85}{25}, Y_p=0.37$

$Y_g=$

$0.485-\frac{2.87}{t_g}=0.485-\frac{2.85}{105}, Y_g=0.45$

For t_g :-

$\frac{t_g}{t_p}=\frac{D_g}{D_p}$

$\frac{t_g}{25}=\frac{320}{70}$

t_g =105

Now, Checking the strength

$(S_o)_{pinion}$= 245×0.37=90.65 mpa

$(S_g)_{gear}$ =245×0.45=110.25 mpa

Since, Pinion is weaker than Gear. Hence, Pinion govern the design.

$F_B=S_o\times C_v\times b\times Y_p\times m$

$=245\times 0.4\times 10\times m\times 0.37\times m$

$F_B=362.6\times m^2$

Using,

$F_t = F_B$

$1.83\times 10^3 = 362.6\times m^2$

$\therefore \quad m=2.2$

Now, Selecting Standards module,

$\therefore \quad m = 2.25$

$b =10\times m=10\times 2.25, b=2_2.5$

$F_B = 362.6\times m^2=362.6\times 2.25^2$

$F_B=1.85\times 10^3$ N

$F_t < F_B$

Hence, Design is safe.

We know,

$$\frac{N_p}{N_g}=\frac{t_g}{t_p}$$

$$\frac{345}{N_g}=\frac{105}{25}$$

$N_g=84$ rpm

$$\omega=\frac{2\pi N}{60}=\frac{2\pi\times 84}{60}$$

$$\omega = 9.1 rad/s$$

But, $V=\omega\times r$

$=9.1\times 0.32$

$V=3.1$ m/s

For km/hr,

$V=3.1\times 3.6$

$V=11.16$ km/hr

VI. ADVANTAGES

- Power transmission efficiency improves.
- Fatigue on rider reduces.
- Capacity of load carrying is increase.
- Generation of noise and friction is minimized.
- It is eco-friendly.

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