

Design and Fabrication of Loopwheel Bicycle

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Abstract In today's world, the bicycles are the most favorite choice when it comes to cause like health, pollution and environment. But if we see in traditional cycle there is not any type of suspension. Due to that rider is not feeling well comfort, because of lack of suspension stresses are developed on rider's body. Also due to lack of suspension system, pedaling efforts also increases. Hence, we need to provide suspension to the cycle. Here we are using loop wheel to provide suspension instead of using traditional wheel. In this, we are replacing spokes with elliptical leaf spring. Elliptical leaf spring works similar to spoke as well as it provide suspension. A loop wheel is a wheel with integral suspension, designed for higher shock absorbing performance and better comfort. Loop wheel offer you a smoother ride. Loop wheel springs are made up of composite material, carefully developed to offer optimum compression and lateral stability as well as strength and durability.

Keywords: Elliptical leaf spring, Suspension system, Loop wheel.

1. INTRODUCTION

A Loopwheel is a wheel with integral suspension, designed for better shock-absorbing performance and greater comfort. Loopwheels give you a smoother ride. The three loops in each wheel work together as a self-correcting system. This spring system between the hub and the rim of the wheel provides suspension that constantly adjusts to uneven terrain, cushioning the rider from bumps and potholes in the road. In effect, the hub floats within the rim, adjusting constantly as shocks from an uneven road hit the rim of the wheel. The spring configuration allows the torque to be transferred smoothly between the hub and the rim. The loop wheels concept is found which has become a very beneficial to the world which reduces the wear and tear of bearing that makes novice after completion its specific life which increases the cost and maintenance of a bicycle. In this case the loop wheels gives a better results and reduces this all the bad impacts created by the normal cycles and gives a one new morning to the innovation. The spring rate for wheelchair wheels was specifically chosen. Being carefully developed and tested for this particular application. Every loopwheel within a product category has the same compression rate as another from the same category. We check this to assure constant manufacturing quality.

2. PROBLEM STATEMENT

In the conventional bicycles there less any type of suspension system. The spokes attached to rim has less load bearing capacity for special purpose cycles. The aim of the project is to design new type of wheel with hub, rim and tyre to provide suspension as well as to support rim and provide better bearing capacity.

3. OBJECTIVE

1. To design better shock-absorbing performance.
2. To give smoother ride.
3. To increase load bearing capacity.

4. LITERATURE SURVEY

A. D. Diwate et. Al (2018), Author says, Several researches have been done in order to make the ride comfortable. Types of cycles have been developed for various applications like Commuter Bikes, Mountain Bike, and Racing bike. This paper presents the Loop wheel which is designed such that the suspension system is integrated within wheel for higher shock-absorbing performance and better comfort. Loop wheels offer you a smoother ride. Loop wheel springs are usually made up of a composite material carefully developed to offer optimum compression and lateral stability as well as strength and durability. [1]

Lakhan Agrawal et. Al (2017) Author says, Bicycles are the most favourite choice when it comes to causes like health, pollution, and environment. Several researches have been done in order to make the ride comfortable. Loop wheels offer you a smoother ride. The three loops in every wheel work along as a self-correcting system. This spring system between the hub and the rim of the wheel provides suspension that continuously adjusts to uneven terrain cushioning the rider from abnormalities in the road wheel. The spring configuration permits the torque to be transferred smoothly between the hub and the rim. In this paper loop wheel manufactured using C20 material [2]

Mr. Tharigonda Niranjan Babu, et. Al (2014) Author says, in automobile sector tends to increasing competition and innovation in design and tends to modify the existing products by new and advanced materials. Leaf springs are special kind of springs used in automobile suspension systems. The main function of leaf spring is not only to support vertical load but also to isolate road reduced vibrations. Therefore the objective of this paper is to present a general study on the performance comparison of composite (E-Glass/Epoxy and Jute E-Glass) leaf spring and conventional leaf spring. The automobile chassis is mounted on the axles, not direct but with some form of springs. The stresses and deflection of steel leaf spring and composite leaf spring are found with great difference. Deflection of composite leaf spring is less as compared to steel leaf spring with the same loading condition [3]

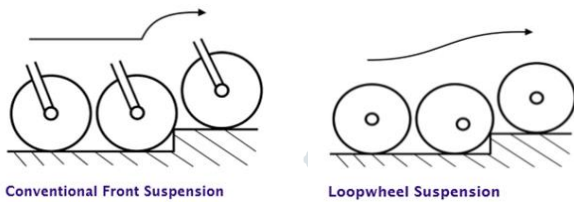
Pankaj Saini. et Al (2013) Reducing weight while increasing or maintaining strength of products is getting to be highly important research issue in this modern world. Composite materials are one of the material families which are attracting researchers and being solutions of such issue. In this paper we describe design and analysis of composite leaf spring. The objective is to compare the stresses and weight saving of composite leaf spring with that of steel leaf spring. The design constraint is stiffness. The Automobile Industry has great interest for replacement of steel leaf spring with that of composite leaf spring, since the composite materials has high strength to weight ratio, good corrosion resistance.. As leaf spring contributes considerable amount of weight to the vehicle and needs to be strong enough, a single composite leaf spring is designed and it is shown that the resulting design and simulation stresses are much below the strength properties of the material satisfying

the maximum stress failure criterion. [4]

5.HOW DOES LOOPWHEEL TECHNOLOGY

WORK?

Loopwheel springs are made from a carbon composite, carefully developed and tested to give optimum compression and lateral stability as well as strength and durability. Specially designed connectors attach the springs to the hub and rim. There are three springs in each wheel, which work together as a self-correcting system. The spring configuration allows for the torque to be transferred smoothly between the hub and the rim. Front and rear loopwheels have different spring rates. A front and rear loopwheel can be used together as a set, or you can use a single loopwheel alongside a conventional spoke wheel. Loopwheels provide suspension on a bike which has none, or can be fitted in addition to suspension forks to give a smoother, more comfortable ride. Are loopwheels heavier than normal



6.CALCULATIONS

6.1 CHAIN DESIGN:

Pitch -9.525mm

1. Roller diameter, $d_1=6.35$ mm

Width' $b_1=5.72$ mm

Transverse pitch $p_t=54.85$ mm

$z_1= 18$

$z_2= 44$

2. Approximate centre distance,

$a = 40 * P$ -----nominal

$a = 40 * 9.525$

$a = 381$ mm

3. No of links,

$$L_n = 2(a/p) + \left(\frac{z_1+z_2}{2}\right) + \left(\frac{z_2-z_1}{2\pi}\right) * \left(\frac{p}{a}\right)$$

$$= 2(381/9.525) + \left(\frac{18+44}{2}\right) + \left(\frac{44-18}{2\pi}\right) * \left(\frac{9.525}{381}\right)$$

$$= 111.10 = 111$$

6.2 Leaf Spring:

6.2.1 Calculate maximum stress:

We used C20 material

Tensile strength= $560N/mm^2$

σ max of C20 material= $560/2=280 N/mm^2$

Given data:

$F=370.22N$

Major Axis of loop spring= $L=300mm$

Minor axis of loop spring= $h=200mm$

$E= 200MPa$

Width of spring= $b=25.4mm$

Thickness of spring= $t=5mm$

$$\sigma \text{ max} = \frac{3FL}{2nbt^2}$$

$$= \frac{3*370.22*300}{2*1*25.4*5^2}$$

$$= 262.36 N/mm^2 < 280 N/mm^2$$

Hence design safe.

6.2.2 Calculation of max. Deflection:

$$\delta \text{ max} = \frac{3FL^3}{8Enbt^3}$$

$$= \frac{2*370.22*300^3}{8*2*10^5*1*25.4*5^3}$$

$$= 5.90 \text{ mm}$$

7.SCHEMATIC DIAGRAM

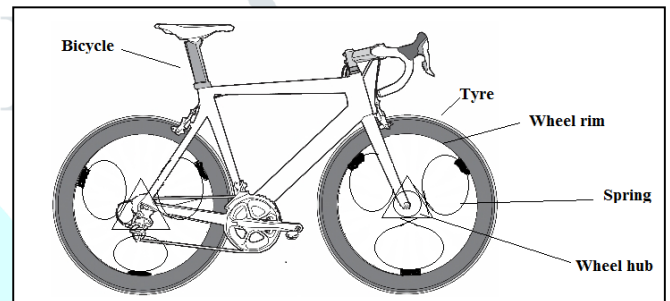


Fig. 7.1. Model Diagram

8.SCOPE

- 1) In this project we will design and fabricate a loop-wheel bicycle which will be able to have extra feature of shock absorption and also the better load bearing capacity.
- 2) The project will contain a bicycle with an improved wheel.
- 3) The wheel will be replaced from conventional spoke-rim system to leaf spring or loop spring.
- 4) The wheel will consist Axle, Hub, Rim, Tyre and Leaf/loop springs. All parts will be mounted in wheel so as to maintain its centre of gravity.

REFERENCES

- 1]Pinku Patil, A.D.Diwate, P.M.Hombal, :-Design and Analysis of Loop Spring Suspension System in Bicycle
- 2]Lakhan Agrawal, Pawan Jadhav, Aakash Patil, Akshay Ahire, S.M. Jadhav , :-Design and Analysis of Loop Spring Suspension System in Bicycle
- 3]Mr. Tharigonda Niranjan Babu, Mr P. Bhaskar And Mr. S. Moulali, :-design and analysis of leaf spring with composite materials
- 4] Pankaj Saini, Ashish Goel And dushyant Kumar, :- Design and Analysis of Composite Leaf Spring for Light Vehicles
- 5] Baviskar A. C., Bhamre V. G. And Sarode S. S., :-design and analysis of a leaf spring for automobile suspension system
- 6] Gulur Siddaramanna, Shiva Shankar and Sambagam vijayarangan, :- Mono Composite Leaf Spring For Light Weight Vehicle