Modified Horizontal Dual Suspension System in Two wheelers

T.Balasubramani
Assistant Professor, Maharaja Institute of Technology, Coimbatore, India.

S.Baraniprasath
UG student, Maharaja Institute of Technology Coimbatore, India

D.Dhinesh Kumar
UG student, Maharaja Institute of Technology Coimbatore, India

R.Maneeshwar
UG student, Maharaja Institute of Technology Coimbatore, India

R.Ponmani
UG student, Maharaja Institute of Technology Coimbatore, India

Abstract - Horizontal suspension system, as the name suggests it is the system of placing the suspension in horizontal position instead of vertical placement. A horizontally mounted vehicle suspension system is provides horizontal suspensional displacement. The suspension system contains at two horizontally mounted shock, which provides for a more comfortable ride within the vehicle. The configuration increases the space to accommodate for the shock or shock strut, as well as allows for the use of full travel shocks in small spaces. The full shock length, with all associated benefits can be used within a smaller space. The suspension system may be used with traditional shock absorbers or shock struts.

Keywords:horizontally mounted shock, horizontal suspensional displacement, full travel shocks in small spaces.

I. INTRODUCTION

Suspension of vehicle handles shock impulse and dissipates kinetic energy with the help of shock absorber. Suspension contributes to the vehicle's handling providing safety and comfort by keeping the vehicle's passengers comfortably isolated from bumps, vibration and road noise.

Shock absorbers work in two cycles-the compression cycle and the extension cycle. Designers have built suspension system that can provide both rider comfort and high speed performance. While designing suspension of vehicle, quality of product is to be taken in to consideration. Hence, designing vehicle is very crucial because it affects the quality of the ride.

With the vertical shock suspension systems, the size of the shock absorbers is limited by the available space in the wheel well. This results in limited travel of the entire shock as well as limited damping. Where a small area is defined, the lowering or raising of the vertical shock mounts has been a solution. Alternatively, shorter shocks may be used, however, this results in less ability to prevent bouncing of the vehicle. A common way to lower a vehicle for improved handling or appearance is to install shorter springs and shocks. However, the use of shorter spring results in reduced travel and stiffer spring thus resulting in some loss of ride quality. Too much lowering causes a very harsh ride, poor handling, and possible suspension damage.

Realizing an active horizontal suspension system using negative stiffness for attenuating the effect of direct disturbance to the isolation table is presented in this paper. The inclination of the suspension system causes dislocation of the suspended table. The vibration isolation characteristics of the proposed active system controlled by negative stiffness controller are investigated on horizontal and inclined surface in this study. Negative stiffness is accomplished between the isolation table and the middle mass and positive stiffness is accomplished between the middle mass and the base.

A common way to lower a vehicle for improved handling or appearance is to install shorter springs and shocks. However, the use of shorter spring results in reduced travel and stiffer spring thus resulting in some loss of ride quality. Too much lowering causes a very harsh ride, poor handling, and possible suspension damage.

1.1. SUSPENSION.

Suspension is the system of tires, tire air, springs, shock absorbers and linkages that connects a vehicle to its wheels and allows relative motion between the two. Suspension systems serve a dual purpose — contributing to the vehicle's road holding/handling and braking for good active safety and driving pleasure, and keeping vehicle occupants comfortable and a ride quality reasonably well isolated from road noise, bumps, vibrations, etc.

These goals are generally at odds, so the tuning of suspensions involves finding the right compromise. It is important for the suspension to keep the road wheel in contact with the road surface as much as possible, because all the road or ground forces acting on the vehicle do so through the contact patches of the tires. The suspension also protects the vehicle itself and any cargo or luggage from damage and wear. The design of front and rear suspension of a car may be different.

An early form of suspension on ox-drawn carts had the platform swing on iron chains attached to the wheeled frame of the carriage. This system remained the basis for all suspension systems until the turn of the 19th century, although the iron chains were replaced with the use of leather straps by the 17th century. No modern automobiles use the 'strap suspension' system. Automobiles were initially developed as self-propelled versions of horse-drawn vehicles. However, horse-drawn vehicles had been designed for relatively slow speeds, and their suspension was not well suited to the higher speeds permitted by the internal combustion engine.

II. EXPERIMENTAL PROCEDURE

2.1 COMPONENTS REQUIRED

The following components are used or required to assemble the setup of modified horizontal dual suspension system.

2.1.1. Tabulation for components required

SL.NO	COMPONENTS	TYPE	MATERIAL
1	Special swing arm	Dual suspension	Mild steel
2	Special triangular section	Pair of same Dimension	Mild steel
3	Spring and damper	coil Spring & Pneumatic damper (150 pulsar)	Nitrox oxide gas damper & stainless steel
4	Connecting bolts & nuts	M10	Mild steel

2.2 CONSTRUCTION

Construction is followed by the layout diagram,

- Where the swing arm (4) is fixed and it has no more movement.

- Then the pivot section or triangular section (3) with three holes at its three corner is mounted with the swing arm by one of its hole.
- Then the wheel (1) and wheel hub (2) is mounted at another hole of the pivot section (3).
- Then the suspension (5) is mounted on the top hole of the pivot section (3) and with the swing arm (4).

2.3 LAYOUT

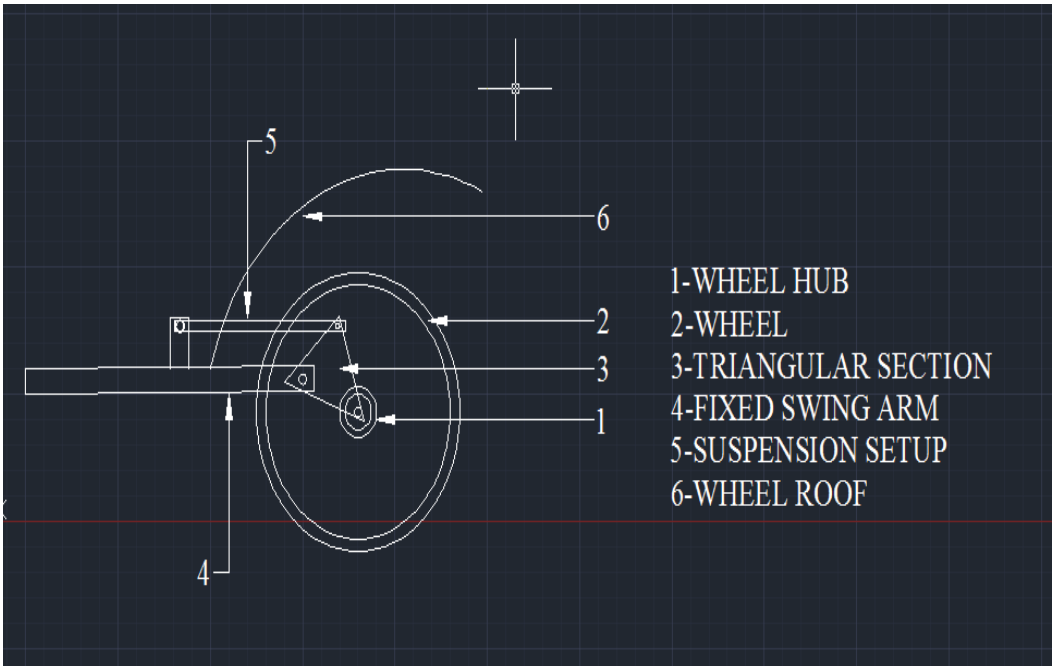

Fig.2.2.1. Layout of modified horizontal dual suspension system.

2.4 WORKING

The working of the setup is described below,

- When load is exerted the wheel and wheel hub is subjected to vertical displacement
- And moves upward direction and there it will push the pivot section (3).
- Thus the section (3) oscillates with respect to the hole mounted to the swingarm (4).
- And thus the top hole mounted to the suspension push the suspension to work horizontally.
- Thus the suspension system attains the horizontal displacement.

Thus the suspension has an effective function with smaller space with full displacement.

III. RESULT AND DISCUSSION

Thus the horizontal suspensional displacement is obtained by using a pivot triangular section (3).

Fig: 3.1. Setup before mounting wheel and suspension.

3.1 PROBLEMS FACED

When we started doing our design our first error in design or problem faced by us on fabricating are as listed below.

- The first one is chain transmission system, due to oscillation of the triangular section with respect to a point. Thus the oscillation created is oscillated at high angle of movement therefore the chain length varies on both the tight side and the slack side (loose side). Due to this change in length of the chain length of transmission system, the chain controls the triangular plate movement and thus this leads to stop or disturb the plate movement or disturb the suspensional movement and cause damage and leads to improper working of the suspensional setup.

Fig: 3.2. Setup of horizontal dual suspension system (left hand side)

- And at last we had another company on brake system. Which lead to improper working as similar to the transmission system where as when the brake pedal is used of common type in our design thus it lead to improper working of the setup. Thus the problem leads to another huge issue where which controls the suspensional movement and leads toimproper braking.

Fig 3.3. Setup of modified horizontal dual suspension system (right hand side)

3.2 RECTIFICATION

The above problems that we faced can be solved by the following rectifications,

- The chain transmission error can be resolved by using the shaft and universal joint system which similar to the trucks and buses thus the this can rectify the chain transmission issues and leads to the smooth transmission.
- Where thus the braking issue can be accomplished by the use of disc brakes or flexible cable braking setup as we found in the mopeds and scooters which is to be mounted within the triangular plate.

Thus we come to the end that problems visible to us can be solved by the above rectifications and we remember that we have designed our own frame from existing frame and thus the rear setup is completely changed and therefore we have assembled the setup alone and not the transmission system.

IV. CONCLUSION

The partially transmitted stress is redirected to the frame to reduce the impact to the user or rider by using a triangular link in between the wheel and suspension of the vehicle.When people think of automobile performance, they normally think of horsepower, torque and zero-to-60 acceleration. But all of the power generated by a piston engines useless if the driver can't control the vehicle. That's why automobile engineers turned their attention to the suspension system almost as soon as they had mastered the four-stroke internal combustion engine. The job of a suspension is to maximize the friction between the tire sand the road surface, to provide steering stability with good handling and to ensure the comfort of the passengers.

According to Newton's laws of motion, all forces have both magnitude and direction. A bump in the road causes the wheel to move up and down perpendicular to the road surface. The magnitude, of course, depends on whether the wheel is striking a giant bump or a tiny speck. Either way, the car wheel experiences a vertical acceleration as it passes over an imperfection. Without an intervening structure, all of wheel's vertical energy is transferred to the frame, which moves in the horizontal direction. In such a situation, the wheels can lose contact with the road completely.

REFERENCES

[1] Lakshmana Kishore “Design and analysis of shock absorber" JRET: International Journal of Research in Engineering and Technology ISSN: 2319-1163

[2] Prince Jerome Christopher J &Pavendhan R, "Design and Analysis of Two Wheeler Shock Absorber Coil Spring" International Conference on Advances in Engineering and Management (ICAEM)

[3] P.R.Jadhav& N.P Doshi,"Analysis of Helical Spring in Mono suspension System Used in Motorcycle" International Journal of Research in Advent Technology, Vol.2, No.10, October 2014 EISSN: 2321-9637

[4] A.V. Lade & R.V. Paropate, et al, "Analysis of mono suspension spring with different materials" International Journal of Research In Science & Engineering e-ISSN: 2394-8299Volume: 1 Issue: 2 pISSN: 2394-8280

[5] G.Ranjith Kumar & Dr.G.HarinathGowd,"Design Evaluation & Optimization of a Two-Wheeler Suspension System" International Journal of Emerging Technology and Advanced Engineering (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 8, August 2014)

[6] Prof. D. R. Chavan, "Suspension in Bikes Considering Preload, Damping Parameters and Employment of Mono Suspension in Recent Bikes "International Journal of Engineering Trends and Technology- Volume4Issue2- 2013

[7] KrzystofMichalczyk,"Analysis of helical compression spring support influence on its deformation" The archive of mechanical engineering vol. lvi 2009 Number 4

[8] P. S. Valsange,"Design Of Helical Coil Compression Spring" International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 vol. 2, Issue 6, November- December 2012, pp.513-522

[9] Karthik Dhayakar "Design and Analysis of Front Mono Suspension in Motorcycle "IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) eISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 2 Ver. VI (Mar - Apr. 2015), PP 84-100

[10] Niranjan Singh “General review of mechanical springs used in automobile suspension system" International Journal of Advanced Engineering Research and Studies E-ISSN2249–8974