International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 7 Issue 3 Ser. I ǁ 2019 ǁ PP. 80-83

Tri-Tilter Mechanism: A Review

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ABSTRACT: *The safety of the vehicle is the first and the fore most important thing to be considered in vehicles. The safety of the vehicle from accident was understated on two major factors: Directional stability and the Aerodynamic force both are correlated to each other. The directional stability refers to stability of a moving body or vehicle about an axis which is perpendicular to its direction of motion while the Aerodynamic Stability means stability against the Aerodynamic forces rise to motion of body relative to air. It arises due to the normal force due to the pressure on the surface of the body and the shear force due to the viscosity of the gas, also known as skin friction. Our analysis shows that to increase the maximum curve at speed of more than 50%, this mechanism is really useful. The method we have used is a simple mechanical tilting system by using the flexible linkages and the shock absorbers.*

Keywords*: Directional Stability, Aerodynamics Force, Skin Friction, Shock absorber*

Date of Submission: 28-10-2019 Date of acceptance: 16-11-2019

I. INTRODUCTION

Increasing population and on trend urbanization of the countries. The traffic conditions are bad and will be worst in the upcoming years. The big nasty part of our daily life is the commute and since the countries (like INDIA) are massively overcrowded and the vehicles are moving like molasses– they are just too big for the congested traffic. The bicycle tilting wheel mechanism which hinders the benefits of a 4 wheelers and wipes out the downsides of the 2 wheelers, with expansion to these Aerodynamic Drag likewise assumes a significant job in vehicle steadiness.

These cars have several advantages:

1. A large portion of the width implies a large portion of the weight, greater inflexibility, more access to typical streets, simpler stopping and a lot snappier travel times.
2. In an electric vehicle, the lighter load of this a lot littler vehicle will upgrade torque control qualities of an electric engine to accomplish "straight increasing speed".
3. At interstate cruising speeds, such autos will utilize a large portion of the frontal region and a large portion of the drag co proficient, in addition to diminished running misfortunes make for a very vitality effective vehicle.

II. LITERATURE REVIEW

Gaurav Khairna, Pratiksha Demse, Sanket Chavan, Snehal Ashtekar, Swapnil Kasar in their paper have achieved the tilting of the vehicle up to 30 degrees with better performance which gives satisfactory performance while taking a sharp turns and their mini-prototype to demonstrate tilting is also working successfully.

Geeverghese k thambi, David andrew, Jefin babu, Jithin raj, Akhil paulson, Asst.Prof Christy v vazhappilly in their paper on the subject entitle as “Design and Fabrication of Tilting Bike” has found a quite successful design to implement the idea of “Tilting Mechanism” to enhance the stability of vehicle. Their universal tilting trike mechanism fits on vehicles having bracket is fixed on chassis. By implementing this tilt mechanism on moped scooters it can be suitable for handicapped person. This Tilting trike gave response as we desired. It reduces accidents which occurs due to skidding.

Pratik Karkare, Prof. Kamlesh Gangrade in their paper called “Fabrication of Tilting Wheel Mechanism: A Vipra Bike” attempted to gather those information and data which can be useful for building a tilting mechanism in the Vipra bike 2 wheeler which having all the basic features of 4 wheeler that is better comfort, easy commute in bad environment conditions, with proper stability, less rolling drag, less traffic space.

Dr V Balambica and Er Vishwa Deepak have described in their paper “Tilting Mechanism for a Four Wheeler” have carried out rigorous calculation and analysis to find the optimum design method to increase the

threshold velocity of a normal fuel run cars while moving through a curved path and have found a successful design.

Objective

1. The objective of this project is to develop a design of a tilting mechanism for automobile
2. To provide directional stability to the vehicle
3. To provide comfort to the passengers
4. To increased load carrying capacity
5. To reduce the accidents due to skidding
6. To reduce the turning radius
7. The aim of this tilting mechanism is to provide banking to the vehicle on unbanked curves, so as to enable added threshold speed on curves.
8. To diminish the streamlined drag of typical 2-wheeler bureau framework is presented.

Working PRINCIPLE

A tilting bike has the advantages of both the type of vehicle that is cars and bikes. If the vehicles lean into corners it makes it a perfect, virtual single track vehicle and even though having three wheels it can be driven like a motorcycle, and the third extra wheel gives the vehicle more traction to make it safe even at high speeds But these vehicles are divided into two categories namely leaning reverse trikes and non-leaning reverse trike. On the one side when we consider the non-inclining vehicle, they are steady similar to a vehicle and are best at low speed and in rush hour gridlock conditions however need to struggle with centrifugal force at high speed during cornering that is taking a large curve. On the other side if we consider a leaning reverse trike they are very good at high speeds and counteracts the centrifugal force by their leaning action but, this type of vehicles cannot be used under heavy traffic regions.

Positioning of centre of gravity

Consider first a 4-Wheeler as seen from the rear, like here to the right. If the vehicle is in a curve towards the left, for example, we can imagine that a centrifugal force is exerted on the centre of gravity (black and yellow circle) of the vehicle-occupants system, while the vehicle's weight exerts a downward gravitational force.

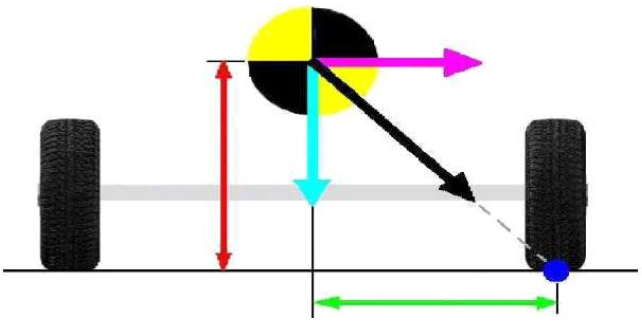

Fig:Position for centre of Gravity

Hence, the diffusive power (red) will in general turn the vehicle over towards the right, around a nonexistent point (dark blue) under the correct tires, while the gravitational power (cyan) holds the vehicle back to avoid rollover. It's as though the centrifugal force and the gravitational force combined together into a resulting force (black) exerted on the centre of gravity to turn it around this imaginary point (deep blue).

We can easily understand that if the centre of gravity height (red) is greater than the half-track (in green) (the half distance between the two wheels seen from the rear), the resulting force (black) will be aligned over the imaginary point (deep blue) and will thus roll the vehicle over in a curve.

III. METHODOLOGY

The approach embraced to utilize standard and by and by utilized parts in structure as opposed to plan all segments from ground up. The advantage of this method is that, you do not have to spend ridiculous amount and time in testing the integrity of each part as they have already proved their worth.

1. The Two wheels at front i.e. one on each side of the handlebar
2. Two shock absorbers associated with the adaptable or flexible rods
3. Adjustable connecting links
4. Fixed connecting links
5.Handle fork

DESIGN AND FABRICATION OF TILTING MECHANISM
SPECIFICATIONS:
Following are the specifications of the vehicle with tilting mechanism:
It would consist of a 3 Wheeled Tilting Mechanism Vehicle

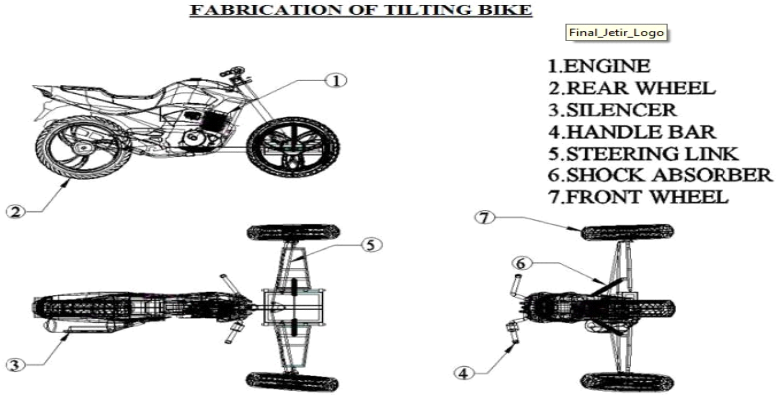

Fig: Design of Tri- Tilter Mechanism

S. No.	PARTICULARS	SPECIFICATIONS
1	Vehicle Type	2-wheeler CT 100
2	Engine	110 CC
3	Fuel	Petrol
4	Leaning Angle	23-28 degrees
4	Leaning Angle	23-28 degrees

Advantages
The net acceleration experienced by the vehicle and rider can always be aligned with the midplane of the vehicle.
A tilting vehicle can be arranged free of cross incline, for example, from the crown in a street or a delicate shoulder.
Since stability no longer depends on the axle track, the centre of mass does not have to be located near the wide axle and instead can be located anywhere between the front and rear axle to optimize other performance characteristics such as ride quality or braking performance.

Disadvantages
Any kind of tilting mechanism, whether free or controlled, invariably requires more complexity and either more weight and/or more cost.
Control of the tilting either requires some kind of automated control system or different behavior from the rider, such as counter steering**.**

Future Scope Of Work
This model can definitely change the existing vehicle industries with its qualities. The maximum leaning angle allows the rider to take turns confidently without having the fear of falling or skidding. Thus, the centre of gravity is always maintained and the resultant forces and their reactions are set. This ultimately increases the life of the mechanical components.

IV. CONCLUSION

We were able to achieve leaning angle up to a certain degrees. This universal tilting wheel mechanism can easily be utilised in vehicle having bracket fixed on chasis. By implementing this tilt mechanism on moped scooters it can be used by person with disability also. This tilting mechanism gave response as we desired. It reduces accidents which occur due to skidding. It also reduces the turning radius of the vehicle.

Fig: Tri-Tilter Mechanism

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Manash Dey" Tri-Tilter Mechanism: A Review" International Journal of Research in Engineering and Science (IJRES), vol. 07, no. 3, 2019, pp. 80-83