

Design and fabrication of universal tilting three wheeler mechanism

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ABSTRACT

This universal tilting three wheeler mechanism which uses the tilting frame structure and bracket together and it can be utilized for any type of motorcycle having bracket is fixed to the chassis of that vehicle. The main advantage of this mechanism is that it can tilt while turning like motorcycle. By this leaning the centre of gravity balances the centrifugal force which is acting on the vehicle and makes it more stable during turning. It gives more traction when roads are slippery. The third wheel offers better braking as well as increases stability. It gives comfortable ride.

Keywords: Universal Tilting mechanism, Tadpole, Leaning reverse trike

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I. INTRODUCTION

According to design three wheeled automobiles has two main types that is 'Delta' and 'Tadpole'. when there is one wheel at front and two at rear configuration is called as 'delta' whereas two wheels at front and one wheel at rear configuration is called as 'tadpole' or 'reverse trike'. Tadpole designs are more stable than delta configuration because the rear wheel drives the vehicle while the front two wheels are responsible for steering. Our tilting trike has tadpole design. Tilting three wheelers are designed as they can lean while cornering like a motorcycle. A tilting three-wheeler tilt in the direction of the turn such vehicles can corner safely even with a narrow track. The disadvantage of traditional vehicles is lateral instability - the car will tip over in a turn before it will slide.

Problem Statement

Two wheelers have sliding possibilities and it causes accidents. Traditional three wheelers and four wheelers losses traction while turning will result in a fall. There are tilting trike having whole tilting mechanism is needed to be permanently welded on vehicle chassis. Dismantling the tilting mechanism from chassis is almost impossible and destructive. It is again hard to transform tilting trike into two wheeler.

Relevance

- The Tilting trike is much safer than motorbikes and scooters, and much smaller and lighter than any car.
- The third wheel offers better braking as well as increased stability whilst braking.
- It considerably reduces the possibility of the tyres sliding.
- It offers more traction when roads are slippery.
- Keeps the vehicle balanced while it is travelling straight.

II. LITERATURE REVIEW

Md. Danish Akhtar [1] studied that, efficiency of the two wheel steering vehicle is proven to be low compared to the four wheel steering vehicles. Four wheel steering system can be employed in some vehicles to improve steering response, increase vehicle stability while moving at certain speed, or to decrease turning radius at low speed. Hence there is a requirement of a mechanism which result in less turning radius and it can be achieved by implementing four wheel steering mechanism instead of regular two wheel

steering. Their experiments have proved that it has high stability and it is a solution to oversteer/understeer.

S. A. Milani [2] et al studied, a tilt control mechanism has been modeled which can reduce the danger of roll over by leaning the vehicle towards the turning center in order to decrease the amount of lateral load transfer (LLT), and by doing so, system combines the dynamical abilities of a passenger car with a motorcycle. Their results are interpreted in presence and absence of controller with different longitudinal speeds and steering inputs; their results are also compared to behavior of a similar FWV and this is concluded that the tilt control system could counteract deficiencies of the TWV compared to the FWV.

Dr. V. Balambica [3] et al proposed, their analysis shows that to increase the maximum curve at speed by more than 50%. The method they have used is a simple mechanical tilting system controlled by a simple DC stepper motor which is controlled electronically. This tilting mechanism if successful should dramatically increase the maximum speed in curves. This should also provide the advantages of increased passenger comfort and handling.

Palash Patodi [4] et al studied, as the world moved into the 20th century, three-wheelers gained in popularity as low-cost, lightweight vehicles that is, until about the late 1920s, when cars generally started going more along the four-wheel track. A three-wheel car is, by design, basically a triangle shape. Depending on where the passengers sit, the location of the engine, and the placement of other critical mechanical components, this means the car either has two wheels up front and one in the rear – Tadpole Design or two wheels in the rear and one up front – Delta Design.

M. A. Saeedi [5] et al proposed, In accordance to the present available technology, the performance of vehicle dynamics control actuation systems is based on the individual control of each wheel braking force known as the differential braking. Also, in order to design the vehicle dynamics control system the linear optimal control theory is used. They proved that for lateral stability, the three wheeled vehicle with single front wheel is more stable than the four wheeled vehicle, which is in turn more stable than the three wheeled vehicle with single rear wheel. Considering turning radius which is a kinematic property shows that the front single three-wheeled car is more under steer than the other cars.

Jawwad A.K. Lodhi [6] et al evaluated, A lean to steer mechanism is basically it's a type of steering principle which uses ball and socket joint for controlling its movement. This mechanism can be utilized for any type of vehicle including skateboards. In fact this mechanism was developed for skateboards and the first of its kind was seen in the year 1995 this board was made by the famous car company BMW the initial models were very bulky and very long with a large turning radius. The main advantage of this mechanism is that it makes the vehicle more stable at high speed turns so that even a four wheeled vehicle can take a turn like a sports bike by leaning to its side.

III. METHODOLOGY

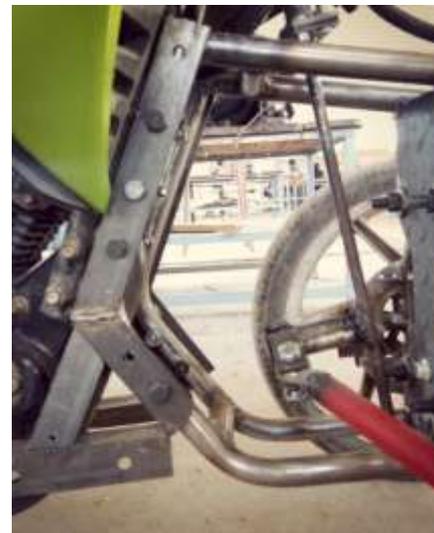
This Leaning reverse trike is built on the Honda CB Twister, with suitable alterations have been made onto the chassis. It

is diamond design twin pipe type chassis and bracket is welded on chassis (as shown in picture 'a').



Picture (a)

12mm diameter holes are drilled to the bracket and tilting mechanism frame as whole tilting mechanism can bolted in that bracket (as shown picture 'b').



Picture (b)

Suspension is double wishbone type with A-shaped lower arms and U-shaped upper arms providing linkages between the chassis and the wheels (as shown in picture 'c').



Picture(c)

This is an independent-type suspension system which allows for a smoother handling and good shock absorption. At the rear, this trike gets a simple twin spring-damper suspension arrangement. Both front wheels are equipped with disc

brake and drum brake provided to rear wheel. The front disc brakes are operated from the right hand lever provided on the vehicle's steering handle. Rear braking is operated from the right foot pedal. Ackerman's steering mechanism is used for the steering system (as shown in picture 'd').



Picture (d)

Using these mechanisms our tilting trike gives desire leaning angle upto 32 degree both side (as shown in picture 'e').



Picture (e)

IV. CONCLUSION

- We have successfully achieved leaning angle upto 32 degrees.
- This 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.

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