

DESIGN and FABRICATION of UNIVERSAL TILTING BIKE MECHANISM

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Abstract-This universal tilting four wheeler mechanism which uses the tilting frame structure and bracket together and it can be utilized for any type of motorcycle having bracket 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 center 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 two rear wheels offers better Braking as well as increases stability. It gives comfortable ride.

Keywords- Better Breaking, Leaning, Rigid Design, RWD, Stability, Suspension, Universal Tilting Mechanism (4 wheeled).

I. INTRODUCTION

A four wheeled vehicle, with two steerable front wheels and two driven rear wheel which may be either rider- or motor powered, includes steering/coupling linkage disposed adjacent to the lower end of a steering column having a handlebar attached to its upper end. The steering/coupling linkage pivotally couples a forward frame to a rear frame which supports the rider and includes the rear wheel and its means for propulsion. The steering/coupling linkage includes a pivot shaft, a bearing housing and a mechanical connection for leaning the rear frame in the direction of a turn so as to compensate for centrifugal force encountered in turning the vehicle. The mechanical connection causes the rear frame to lean in a controlled relationship to the amount of rotation of the steering shaft, within rotational limits, to emulate the leaning action of a conventional bike when making a turn. According to design three wheeled automobiles has two

Two wheelers have sliding possibilities and it causes accidents. Traditional three wheelers and four wheelers losses traction while turning will result in a fall. The leaning suspension will improve the control of the driver on the vehicle so to avoid skidding. The tilting of wheel generates the camber thrust which adds in the steering efforts in order to turn the vehicle without any loss in total efforts. Accidents are resulting in loss of invaluable

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 wheelers are designed as they can lean while cornering like a motorcycle. A tilting four 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

lives, material and money. So far the accident preventing systems are not very efficient and the loss is continuous. There are many systems like air bags, ABS, GPS, traction control, etc. which can prevent accident to some extent.

RELEVANCES

- The Tilting bike is much safer than motorbikes and scooters, and much smaller and lighter than any car.
- The two rear wheels offers better braking as well as increased stability while 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

International Engineering Research Journal (IERJ), Special Issue Page 102-104, 2017 ISSN 2395-1621S.

A. Milani 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 countervail deficiencies of the TWV compared to the FWD.

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Danish Akhtar 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 over steer/understeer.

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Stabilized Three - Wheeled Vehicle :A three wheeled motorcycle in which two front wheels are interconnected with a conventional motorcycle frame by parallelogram configured coupling assembly utilizing a pair of cross members pivoted connecting hubs of the front wheels and pivotal connected to the frame, Foot resting platforms are positioned on either side of the motorcycle, being fixedly connected to one of the cross members in the front and pivotally connected to the motorcycle frame at the rear.

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Leaning Vehicle with Centrifugal Force Compensation A three wheeled vehicle, with two steerable front wheels and a driven rear wheels which may be either rider or motor powered includes steering linkage disposed adjacent to the lower end of the steering column having a handlebar attached to its upper end. The steering linkage pivotally couples a forward frame to a rear frame which supports the rider and includes the rear wheels and its mean for propulsion. The steering linkage includes a pivot shaft, a bearing housing and a mechanical connection for leaning the rear frame in a direction of a turn so as to compensate for centrifugal force encountered in turning the vehicle. The mechanical connection causes the rear frame to lean in a controlled relationship to the amount of rotation of the steering shaft, within rotational limits, to emulate the leaning action of a conventional bicycle.

International Engineering Research Journal (IERJ), Special Issue Page 102-104, 2017 ISSN Jawwad A.K. Lodhi 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 sidewhen making a turn.

III. METHODOLOGY

This Leaning mechanism is built on the Honda Karizma, with suitable alterations have been made onto the chassis. Its chassis is been modified at several locations needed to attach the new leaning mechanism.

- The front telescopic suspension is completely eliminated from the chassis by cutting right after the neck of the frame.
- Secondly the rear end the swing arms are eliminated and solid brackets are welded on it making it a one rigid frame.

VEHICLE SPECIFICATION

SR. NO.	PARTICULARS	SPECIFICATIONS
1	Vehicle type	4 wheel RWD Honda Karizma
2	Displacement	223cc
3	Maximum Torque	18.35Nm@6000rpm
4	Maximum Power	17Bhp @ 7000 rpm
5	Dimensions LxWxH (mm)	2125 x 755 x 1160

Table no: 1

MATERIAL SPECIFICATION

SR. NO.	PART	MATERIAL	SIZE
1	Double – A arm	MS Round bar	1inch dia
2	Suspension bracket	MS Round Hallow bar	5inch dia
3	Sheet metal	MS	6mm thick
4	Knuckle	MS	7mm thick

Table no: 2

- Suspension is a double wishbone type with 'A' shaped lower and upper arms providing linkage between the face plate(chassis) and wheels(knuckles) (as shown in Fig 'a').

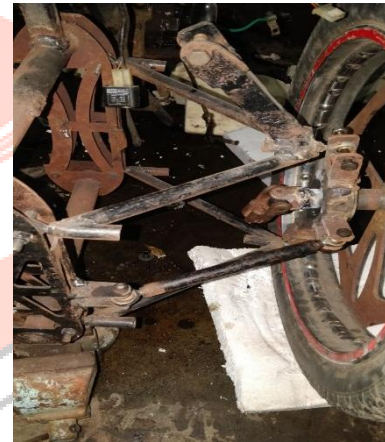


Fig. a

- This is an independent type suspension system which allows a smoother handling and good shock absorption both at the front and rear.
- Both front wheels are equipped with disc brakes attached to the wheels. (Fig. 'b').



Fig. b

- The normal alloy wheels are replaced by spoke wheels because they are lighter than alloy wheels and where proper fitting into the bikes design.
- The conventional spokes of wheel are cut and removed and replaced by newly designed laser cut metal plate to hold support the wheel body.(Fig. 'c')



Fig. c

- At rear a common disc brake for both the rear wheels. Over all enhancing the braking for the whole vehicle.
- A right front steerable wheel and a left front steerable wheel disposed on respective sides of a central steering shaft having a handlebar attached thereto wherein each of said right and left front steerable wheels has a

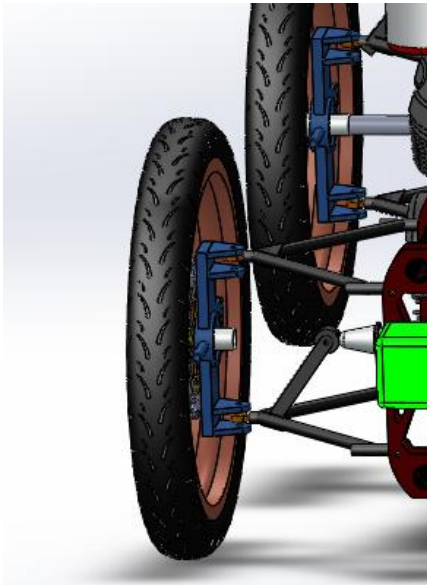
respective turning pivot. The rear wheel are driven by drive chain at the rear axle for both rear wheels

- The suspension for rear and front is considerably same neglecting minor changes. It is a single spring damper designed and placed in the center of opposite side double 'A' arms providing better stability and good shock absorption at normal as well as off-road conditions.(Fig. d)



Fig. d

- Pitman arm steering mechanism is used for steering system. (Fig. d)
- The front neck is extended to some calculated parameters to hold support the whole mechanism on front end as seen in the above figure. It holds the four face plates welded to it each plate then providing a linkage with double 'A' arm which actually provides leaning ability to the whole body.
- The steering rod, the upper and lower double 'A' arm are connected to the wheel by an intermediate part designed as a knuckle. Its main function is to help steering and guide the 'A' arm the vertical motion of shock absorption.(Fig. e)



REFERENCES

- “International Engineering Research Journal (IERJ)”, Special Issue Page 102-104, 2017 ISSN 2395-1621
- “International Journal of Innovative Research in Science, Engineering and Technology” (An ISO 3297: 2007 Certified Organization)
- “International journal of research in aeronautical and mechanical engineering”
Vol.2 Issue.3, March 2014, Pgs. 122-128
- “IJSRD - International Journal for Scientific Research & Development” | Vol. 4, Issue 10, 2016 | ISSN (online): 2321-0613
- International Journal of Application or Innovation in Engineering & Management (IJAIEM) Volume 4, Issue 5, May 2015(ISSN 2319 – 4847)

IV. CONCLUSION

- Because of the limitations of bike there are so many bike accidents registered every year and there are so many lives lost, but because of this mechanism the performance and reliability is improved by a noticeable value.
- It offers twice the traction on wet as well as sandy off-roads which results in elimination skidding and losing control of vehicle at high speed turns. It is the best mechanism for leaning suspension.
- Because of two front disc brakes better braking forces are applied while stopping the vehicle and during running into a corner, even making a better option for handicapped person.
- Can be driven at high speed in rainy season with further addition of ABS, as it gives anti skidding effect.
- This tilting bike gave us responses as we desired.

