

Fabrication of Tilting Wheel Mechanism: A Vipra Bike

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Abstract: As we know that safety of the vehicle is the first and the foremost thing to be considered in 2-wheelers 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 former is stability of a moving body or vehicle about an axis which is perpendicular to its direction of motion. Stability of a vehicle concerns itself with the tendency of a vehicle to return to its original direction in relation to the oncoming medium (water, air, road surface, etc.). The latter is the force exerted on a body by the air (or some other gas) in which the body is immersed, and is due to the relative motion between the body and the gas. Aerodynamic force arises from two causes: 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. To be protected to the risk of injury the best solution is to fabricate the personal mobility which leads to the proper vehicle stability with its tilting wheel and cabinet cover body and also requires less traffic space as compared to the 4-wheelers with less fuel consumption.

Keywords: 2-Wheelers, Stability, Tilting Wheel, Aerodynamic Force, Fuel Consumption etc

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.

For the individual who like to drive the vehicles without affecting the traffic one can choose the VIPRA Bike Tilting Wheel Mechanism which inhibits the advantages of a 4 wheelers and eliminates the drawbacks of the 2 wheelers.

According to Ali Behnood And Fred L Mannering Paper; A wide range of variables potentially affecting injury severities was considered including Driver - contributing factors, Location and Time of day, Crash-specific factors, Driver attributes, Road way characteristics, Environmental conditions, and Vehicle characteristics. To this they also considered the temporal stability behavior for individual parameters:

1. Driver's gender
2. Physical condition of the driver.
3. Driver attribute
4. Roadway characteristics
5. Environmental conditions
6. Vehicle characteristic
7. Type of the vehicles
8. Vehicle occupancy

With addition to these Aerodynamic Drag also plays an important role in vehicle stability. [1]

II. Objective Of Fabrication

To make the vehicle more potent and accessible than the normal 2-wheelers some innovations are done and they are as follows:

- Tilting wheel increases the stability of the vehicle.
- To decrease the aerodynamic drag of normal 2-wheeler cabinet system is introduced.
- Comfort full drive of the vehicle over the long distances.
- Seat belt makes it safer as compared to normal 2-wheelers.

Types of Mechanism Used In Fabrication

As the 2 wheeler have stability problem with their speed, since at slower speed there is the major problem with controlling the two wheelers with gear shifting and applying brakes due to which two wheeler stability decreases or say control over vehicle decreases there comes the two wheeler with tilting mechanism.

Mechanism is a device designed to transform input forces and movement into desired sets of output forces and movement. Mechanism generally consist of moving component such as gear, gear trains, belt and chain drives, linkages as well as frictional devices such as brakes and clutches, and structural component such as frames, fasteners, bearings and springs.

For VIPRA BIKE we have tried several mechanism and they are as follows:

1. Outward Tilting Mechanism:

As the name suggest in this mechanism the wheels out triggered from the vehicle towards the ground, this is attached to the screw nut mechanism through which the motor is attached. As the shown in the figure, the mechanism takes the long path to travel which in turn takes more time as required for the process. Though the process was unique but it requires a greater motor rpm which can be compromised, even than also the mechanism looks irrelevant due to its out triggered motion.

2. Scissor Mechanism

Scissor mechanism is very much similar to the outward tilting mechanism, since in the above one there is one major problem that is time consuming due to less motor rpm, so to reduce that we have used the links in the form of scissor arrangement such that it travel larger distance in less rpm, but since the mechanism was good than also it requires larger side space to enables the mechanism and also due to pin joint links it strength for carrying vehicle weight is less.

3. Under Vehicle Tilting Mechanism:

The under vehicle tilting mechanism is similar to the outward tilting mechanism; the only difference is that the wheel does not popped out of the vehicle body. Though it requires more time than the Scissor Mechanism but weight carrying capacity is good for this mechanism.

III. Sub System Of VIPRA Bike

1. DC Geared Motor:

Gear motor is a combination of motor and gearbox. When users choose DC motor, they will find it cannot reach their requirement because of high speed or low torque, so gear motor is their best choice. [2]

A **Johnson Gear dc motor** is a simple DC motor with gear box attached to the shaft of the motor which is mechanically commutated electric motor powered from direct current (DC).It has exclusive high torque, best suitable with highly developing capable robots or robotic platform, various automation purposes.

Gear box is built to handle the stall torque produced by the motor, the motor Shaft comes with a metal bushing for wear resistance.

Specifications:

- Dimensions: Length – 100mm; Diameter – 37mm ;
- Shaft diameter – 6mm.
- Weight – 300 grams
- Operating Voltage – 12v
- Shaft Diameter – 6mm (D – shape cut)
- Voltage 12v; no load current – 100mA; full load current – 1.9 A
- Stall Torque (kgcm) in relation to RPM
- 20 rpm – 60
- 60 rpm – 35[3]

2. Battery

The lead–acid battery was invented in 1859 by French physicist Gaston Plante and is the oldest type of rechargeable battery. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge currents means that the cells have a relatively large power-to-weight ratio. This feature, along with their low cost, makes it attractive for use in motor vehicles to provide the high current required by automobile starter motors. As they are inexpensive compared to newer technologies, lead–acid batteries are widely used even when surge current is not important and other designs could provide higher energy densities. [4]

3. Microcontroller:

A microcontroller is a small computer (SoC) on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM.

Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes.[5]

4. Reed Switch

An ordinary switch has two electrical contacts in it that join together when you push a button and spring apart when you release it. Rocker switches on wall lights (like the one in the photo up above) push the two contacts together when the switch is in one position and pull them apart when the switch flicks the other way.

A switch is like a drawbridge in an electric circuit. When the switch is closed, the "bridge" is down and electric current can flow around the circuit; when the switch opens, the "bridge" is up and no current flows. So the purpose of a switch is to activate or deactivate a circuit at a time of our choosing.[6]

5. Body Cover Arrangement

As per its utilization, environmental and streamlined, VIPRA BIKE is presented to different climate sorts who cause wear and tear. Notwithstanding the dust and grime kept by nature, there is additionally the irritation of cleaning bug effects and feathered creature droppings. Branches or protests that can scratch or cause minor harm to a vehicle's body are another auto care nuisance.

IV. Orthographic Views And Isometric View

Orthographic view contain elevation plan and profile view of VIPRA BIKE and Isometric view shows three dimensional perspective of VIPRA BIKE.



Fig. 1 Side View of VIPRA BIKE



Fig. 2 Isometric View of VIPRA BIKE



Fig.3 Tilting Wheel of VIPRA BIKE

V. Conclusions

By this anticipate study I attempt 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.

As we know with the growing need using 4-wheel cars as a personal mobility is the good option with many aspects such as for better comfort, to commute in bad environmental conditions, etc. , but on the cost of less efficiency about 50 % , double traffic space, rolling drag etc.,

On the other hand if we choose two wheeler for the personal mobility than it would have less fuel consumption and filter traffic easily, decreases rolling drag but it suffers with the bad aerodynamic, lack of comfort , less stability on slippery surfaces and slower speed , risk of injuries etc.,

The best solution for personal mobility is VIPRA BIKE which has advantages of both of car and bike and also special tilting wheel mechanism which stabilizes or control the vehicle at slippery surface and slower speed.

The Vipra Bike is the innovative approach for women and elder peoples on the platform of stability of the vehicle and even on the slippery road surfaces. The mechanism is used for the tilting wheel is the under vehicle tilting mechanism.

Reference

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