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DESIGN AND FABRICATION OF STEERING SYSTEM FOR FORMULA STUDENT VEHICLE

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Abstract - The basic main aim of this project is to design and fabricat of the steering system for formula student vehicle.This is typically achieved by a series of linkages, rods and pivots each individual wheel is steered by pivot point before the wheel that makes the steering tend to be self-centring to motion of the body to travel.To provide the graceful operation of turning the vehicle. There was design of equipment and calculations for smooth operation of turning vehicle, also the complete knowledge about the working and mechanism of steering system to be covered. In this project we deal about the design process,which consists of first determining the steering parameters and geometry and analysing it on lotus shark suspension analyser after the analysis and optimization of system through the geometry the entire system is design in solid works.Different analysis were performed while iterating and getting the best possible design which is suitable for our vehicle and also for the rider. The overall components designing and fabrication of steering system for our vehicle was done and tested and proved to be reliable in all possible working conditions.

Key Words: Steering Column,Camber,Caster,Knuckle.

1.INTRODUCTION

Automobile Steering system is composed of the following: A steering shaft that included in the steering column and are connected to steering wheel or steering handel , An intermediate shaft is connecting in between shaft and the steering gear(rack&pinion) and steering gear for operating wheels. Intermediate steering that is shaft connects the steering shaft to the rack&pinion. This component are cannot be arranged on the same axis due some certain limitations in vehicle design. The Drivers can change the direction of vehicles by operating steering wheel of the steering system. Steering system is important for steering related to the reaction force.Apparatus having the influence on steering wheel.Torsional and rigidity of intermediate shaft which is connected to influences the steering feeling in accordance with the development within the automobile performances, so it's necessary to enhance the performances of the intermediate vehicle steering shaft. The objective of this project is to style a intermediate steering shaft which has greater working capabilities as existing one by saving the fabric and to seek out out vibration effects and intermediate steering shaft at frequencies in an automotive steering mechanism . This objective is worth pursuing because the issue of stresses developed on the object, the design requirements at the joints, deformation in the body due to vibrations, continuous twisting and loading. These are the common one related to intermediate steering shaft and is the real problem in the modern automotive industry. Rack and pinion unit is mounted in the cockpit of an vehicle chassis. For most high volume production, this is usually mounted on the other side of this panel.

2. Body of Paper

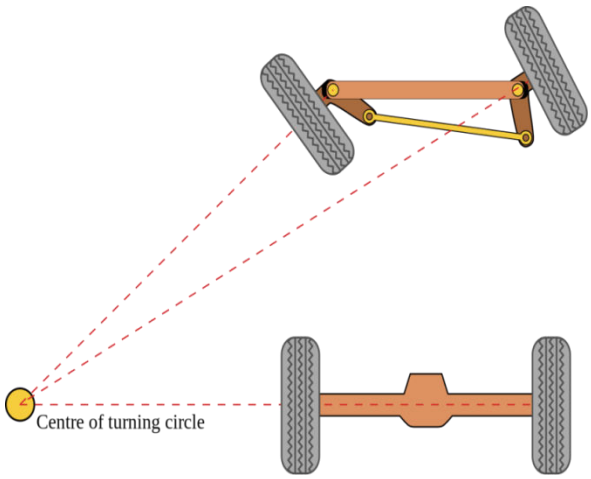
STEERING SYSTEM OF A FORMULA VEHICLE

Rack and pinion steering mechanism:

1. Steering wheel
2. Steering column
3. Rack and pinion
4. Tie rod
5. Knuckle

TYPES OF STEERING MECHANISM

- Ackermann steering mechanism
- Davis steering mechanism
- Anti Ackermann steering mechanism



Ackermann steering

It is a geometric arrangement of linkages in the steering of a car. Designed to be solve in problem of wheels on the inside and outside of a turning needed to trace out circles of different radii. When vehicle is turning and inner front wheel needs to be turn at a different angle to outer side.Because they are used to turn at different angles. This model is fully parameterized, allowing customization.

Advantages Ackermann steering

1. Simple geometry and ease of calculations
2. Avoids front tire slippage and helps in achieving pure rolling
3. Easy to fabricate

Disadvantages Ackermann steering

1. Gear arrangement adds weight to the vehicle.
2. More maintenance is needed.
3. Mechanism is complex.

3. LITERATUREREVIEW

Rince Wins, Dhanesh Chatta and Anish Nair et al., "DesignofPneumatic Collapsible Steering" in this paper, he studiedthataswe know, the very fact is extremely correct that accidents are increasing day by day. On considering the injury potential of wheel this project gives a replacement and more safer design for the wheel . It is sensitive since it work with sensors during collision. Steering column provides good safety device against collision. Its maintenance cost is low since need only to replace air organs in it. The main advantages of pneumatic steering are that gives working space for correct functioning of bag.

M. Keerti, K. Sandhya, K.Srinivaset al., "Static & Dynamic Analysis of Spur Gear using Different Materials" in this paper, he studied that, composite materials is approximately similar as compared to the structural steel, iron and aluminium alloy. So from these result, we conclude in that all the stress induced in the deformation over the weight of the composite of spur gear. It is almost similar to compare to the structural of steel spur gear. So, Composite materials are capable forthe using in automobile vehicle gear boxes instead of existing cast steel gears with in the better result. when design is safe the frequencies obtained exceeded the natural frequency of the spur gear.

4. CONCLUSIONS

Finally we have finished our design. The steering system for a formulaSAE. Car describing all the elements and choosing the better options to make it and to adapted in a total project with the characteristics of FormulaSAE.

The first step was to know the formulaSAE rules and the theoretical fundamentals about the steering as Ackermann or Davis. Considering about the element which have been designed by our self, we have done this task based on our design in three parameters : comfort and safety for the rider, improve the features of the car.

To situate the steering wheel and column we have made a study in order to achieve the measures for the rider. Once we finish this task, we have calculate the position of a steering wheel achieving the rider in the good position, avoiding an extreme tiredness and respecting the SAE rules.

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