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Design and Analysis of Shock Absorber by Varying Spring Materials

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ABSTRACT: Suspension spring is an energy storing device used in shock absorber to damp shock impulse. It reduces the effect of travelling over rough ground leading to improve comfort by reducing amplitude of disturbances. The structural analysis is done by considering loads finally comparison is done for different materials to select best material for suspension spring. Modeling is done in solid edge and analysis is done in ANSYS

KEY WORDS: Damping, ANSYS, Solid Edge, Suspension

1. INTRODUCTION

The suspension system is one of the main parts of the vehicle, where the shock absorber is designed mechanically to handle shock impulse and dissipate kinetic energy. In a vehicle, shock absorbers reduce the effect of traveling over rough ground, leading to improved ride quality and vehicle handling. A spring is defined as an elastic body, whose function is to distort when loaded and to recover its original shape when the load is removed. It is an elastic object used to store mechanical energy. The main part of the vehicle is shock absorbers, they designed mechanically to handle shock impulse and dissipate kinetic energy. In a vehicle, shock absorbers reduce the effect of traveling over rough ground, leading to improved ride quality and vehicle handling. While shock absorbers serve the purpose of limiting excessive suspension movement, their intended sole purpose is to damp spring oscillations. Modeling is done in solid edge and analysis is done in ANSYS.

II. PRINCIPLE

The Suspension is a System that designed to provide a smooth ride for you and your passengers and to safely keep all the wheels in contact with the ground at all times, given all road conditions. Technological improvements are constantly being made to optimize the suspension system.

III. CLASSIFICATION

- Tires
- Wheels (rims)
- Shock Absorbers (dampers)
- Springs
- McPherson Strut Suspension
- Upper Control Arms (A-arms)
- Lower Control Arms
- Sway Bars (anti-roll bars)
- Torsion Bars

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- Axle System
- Driveshaft
- Wheel Alignment
- Tire Pressure

IV. MATERIAL SELECTION

- Carbon Steels (C1074, C1075, C1095, C67)
- Chrome Vanadium (SAE 6150, 50CrV4)
- Monel

V. MODELING OF SUSPENSION SPRING

Spring Specifications

Wire diameter (d) =8 mm,
Coil outer diameter (D) =40 mm,
Coil free height (h) =200 mm,
No. of active coils (n)=12,
Pitch (P) =15 mm

Model no 1

Coil diameter =8mm,
Total length=208mm
Spring length=192mm
No. of turns= 13

Model no 2

Coil diameter =8mm,
Total length=210mm
Spring length=198mm
No. of turns= 10



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VI. REGRESSION TESTING

Regression testing is an inescapable and very expensive task to be performed, often in a resource and time constrained environment. The goal is to minimize the time spent in the process of testing by reduction in the number of test cases to be used. Thus various techniques are being used for test case

VII. DAMPER

Safety and driving comfort for car's driver are both dependent on vehicle's suspension system. Safety refers to the vehicle's handling and braking capabilities whereas comfort of the occupants of a car correlates to tiredness and ability to travel long distance with minimal annoyance. The need for dampers arises due to the roll and pitches associated with vehicle maneuvering, and from the roughness of roads. Rapidly increasing power available from the internal combustion engine made higher speeds routine; plus the technical aptitude of the vehicle and component designs, coupled with a general commercial mood favoring development provided an environment that led to invention and development of shock absorbers. FSAE is an international design competition that aims at building a prototype of a Formula style race car for the non-professional weekend autocross racer. Each team designs, builds and tests a prototype based on a series of rules whose purpose.

VIII. MATERIAL PROPERTIES

For Monel metal properties are

Young's modulus = 1.79×10^5 MPa,
Poisson ratio = 0.3,
Density = 8.08×10^{-12} kg/m³

For Inconel metal properties are

Young's modulus = 2.15×10^5 MPa
Poisson ratio = 0.29
Density = 8.2×10^{-15} kg/m³

For Nickel metal properties are

Young's modulus = 2.07×10^5 MPa,
Poisson ratio = 0.31
Density = 8.8×10^{-15} kg/m³

IX. APPLICATIONS

- It is used in shock absorber of two wheelers.
- It is used to damp shock impulse during travel on rough grounds.

X. CONCLUSION

Modeling and analysis of suspension spring is done. Modeling of suspension spring is done in solid works by using various commands. Suspension spring with various dimensions is done.

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