



Spring Less Suspension Innovation With Bevel Gear

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Abstract: The suspension system of an automobile plays a critical role in supplying a smooth and easy going ride while ensuring safety and stability. Traditional suspension systems commonly rely on mechanical springs for absorbing shocks and vibrations from the road. However, there is growing attention in spring less suspension systems that alternative technologies, such as bevel gears, for suspension and damping. This paper presents an exploration of the utilize of bevel gears in spring less suspension systems for automobiles. The benefits and difficulties of using bevel gears in place of traditional springs are discussed. Bevel gears offer a compact and lightweight solution, precise control over suspension aspects, and potential reduction in complexity and maintenance necessities. However, challenges such as design complexities, durability and reliability issues, and increased cost need to be addressed. The principles of bevel gears and their application in suspension systems are reviewed, and the current state of research and development in this area is highlighted. The proposed advance and methodology for further investigation are discussed, emphasizing the significance of this concept in advancing the field of automotive suspension systems.

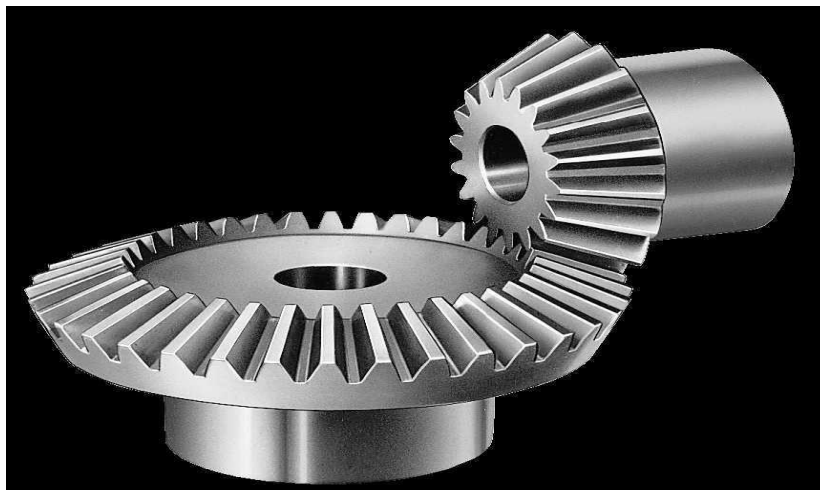
Keywords: sensitive: Lacking spring suspension, Wear, Bevel gears, Self-aligning, Relaxed ride, diminishing

I. INTRODUCTION

The suspension system of an automobile plays a crucial role in providing a smooth and relaxed ride while ensuring safety and constancy. Traditional suspension systems commonly rely on mechanical springs for absorbing shocks and vibrations from the road. However, recent The suspension system of an automobile is a critical component that plays a vital role in providing a smooth and relaxed ride, while ensuring safety and constancy. Traditional suspension systems typically rely on mechanical springs for compelling shocks and advancements in automotive technology have led to the emergence of spring less suspension systems that uses alternative technologies for suspension and damping, including the use of bevel gears. Bevel gears are a type of gears that have a conical shape with intersecting axes. They are commonly used in mechanical power transmission systems, but they can also be working in suspension systems to provide suspension and damping characteristics without the need for traditional springs. The use of bevel gears in spring less suspension systems offers several potential benefits, including compactness, lightweight, precise control over suspension characteristics, and potentially reduced complication and maintenance demands.

II. BEVEL GEARS

Bevel gears are a type of gears that have a conical shape and meeting axes, allowing them to convey rotational motion between non-parallel shafts. They are used in a wide range of applications, including automotive, aerospace, marine, and industrial machinery. Bevel gears are designed to mesh concert at a specific angle, known as the "pitch angle" or "cone angle," which determines the gear ratio and the motion move attributes.





III. RUBBER VISA WHEELS

A spring less suspension system for an automobile can be created using bevel gears and components from rubber-visa wheels. Rubber-visa wheels, also known as airless or non- pneumatic wheels, are made from solid rubber or similar materials, removing the need for air-filled tires and providing a unique suspension capability. Bevel gears with cone-shaped teeth can be used to transfer power and torque from the vehicle's axle to the rubber-visa wheels, supplying a form of suspension that absorbs shocks and vibrations. The rubber-visa wheels can act as adjustable elements that deform and absorb impacts, providing a cushioning effect similar to traditional springs. Proper engineering design and calculations should be considered to ensure that the bevel gears and rubber-visa wheels are properly integrated into the suspension system to gives the desired performance, constancy, and comfort for the specific use in the automobile. Testing and validation should also be conducted to ensure the safe and reliable operation of the spring less suspension system using the bevel gears and components from rubber-visa wheels



IV. SUPPORTIVE FRAME OF WOOD

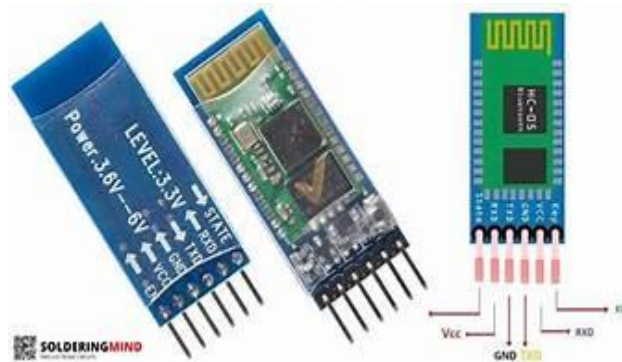
Wood of 10 x 10 inch. 1.1". We have assembled the model attachment in such a way in which a white board of 10 × 10 size is used as a base upon which Adriano Bluetooth initiator switch is connected using double sided tape. The complete mechanism is supported using four 12 inches well welded iron rods.

V. DC MOTOR 60rpm

A spring less suspension system for an automobile can be created using bevel gears and components from a center shaft DC motor with a rotation speed of 60 RPM. Bevel gears with cone-shaped teeth can be used to convey power and torque from the motor to the suspension system, eliminating the need for conventional springs. The center shaft DC motor can provide the essential rotational motion for the suspension system to function. Components from the motor, such as the gears, shafts, and housing, can be repurposed and altered to serve as integral parts of the suspension system. Proper engineering design and calculations should be considered to ensure that the bevel gears and motor components are appropriately integrated into the suspension system to provide the desired accomplishment, constancy, and stability for the specific application in the automobile. Testing and validation should also be conducted to ensure the safe and dependable operation of the spring less suspension system using the bevel gears and components from the center shaft DC motor with a rotation speed of 60 RPM.

VI. HC-05 BLUETOOTH MODULE

Wireless communication is swiftly substituting the wired connection when it comes to electronics and conversation. Designed to replace cable connections HC-05 uses serial conversation to communicate with the electronics. Usually, it is used to connect small devices like mobile phones using a short-range wireless connection to swap files. It uses the 2.45GHz frequency band. The transfer rate of the data can vary up to 1Mbps and is in range of 10 meters. The HC-05 module can be operated within 4-6V of power supply. It supports baud rate of 9600, 19200, 38400, 57600, etc. Most crucially it can be operated in Master-Slave mode which means it will neither send or collect data from external sources.



VII. L298N MOTOR DRIVER MODULE

This **L298N Motor Driver Module** is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. **L298N Module** can manage up to 4 DC motors, or 2 DC motors with directional and speed control. The L298N Motor Driver module include of an L298 Motor Driver IC, 78M05 Voltage Regulator, resistors, capacitor, Power LED, 5V jumper in an integrated circuit.

VIII. UNO R3 SMD BOARD ATMEGA328P

Arduino UNO SMD is a microcontroller board established on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It involve everything needed to support the microcontroller; simply relate it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The "SMD" stands for surface-mount device, and the microcontroller (ATmega328p) is soldered openly to the board.



IX. CONSTRUCTION

A spring less suspension system for an automobile can be intended using bevel gears in its creation. Bevel gears, which have cone-shaped teeth, can be used to convey power and torque from the vehicle's axle to the suspension system, It is used for absorbing shocks and vibration. The bevel gears can be arranged in different arrangement, such as worm gears or helical gears, to create suspension system that can effectively dampen vibrations and impacts from uneven road surfaces. Proper engineering design and calculations should be considered to determine the appropriate gear ratios, tooth profiles, and placement of bevel gears in the suspension system to achieve the desired performance and stability. The construction of the spring less suspension system using bevel gears can provide advantages such as reduced weight, simplified design, and potentially lower cost compared to traditional spring-based suspensions. Testing and validation should be conducted to ensure the safe and reliable operation of the bevel gears-based spring less suspension system in the automobile, taking into account factors such as load capacity, durability, and safety requirement.



X. WORKING

In spring less suspension system, shocks are absorbed with the help of rotation of the bevel gears. When the vehicle encounters obstacle or rough ground, the wheels attached to the bottom sides of the frames experience upward or downward forces. These forces are transmitted through the frames to the bevel gears. The bevel gears are connected in such a way that they can rotate independently of each other. As one wheel moves up or down, it causes the corresponding bevel gear to rotate. This rotation transfers the energy of the shock into rotational motion, which is absorbed by the gears. Since the bevel gears are connected to each other and to the frames via bolts, the rotational energy is distributed across the system, reducing the impact felt by any single component. This helps to smooth out the ride and protect the vehicle chassis from damage. Overall, the bevel gear mechanism effectively absorbs shocks by converting them into rotational energy. The differential which consists of a gear wheel with three drive shafts and the characteristic that the speed of rotation of one shaft is equal to the average speed of the others or a fixed multiple of this diameter is combined with an oscillating system and forms a spring less suspension system the oscillation is repeated the frame of the system is mostly made of mild steel the frame that carries the tires oscillates freely and is connected to the differential by a motor that is attached to the gear of the differential mechanism making it the drive gear each bevel gear on either side of the drive gear connects it to two gears on each side of the driven gear. Each wheel has its own motor that powers it. Even on rough terrain, the oscillation function ensures that the vehicle continues to move forward, while the engine ensures that the wheels and gears keep turning.

A. BENEFITS

1. Enhanced Ride Comfort: Spring less suspension systems with bevel gears can provide improved ride comfort by actively adjusting the suspension characteristics in real-time. This allows for better shock absorption, reduced vibrations, and smoother ride quality, resulting in a more comfortable driving experience for occupants.
2. Improved Handling and Stability: Active suspension systems using bevel gears can dynamically adjust the suspension settings to optimize vehicle stability and handling. By adapting to changing road conditions and driving dynamics, these systems can enhance traction, minimize body roll, and improve overall vehicle control and stability.
3. Customizable Driving Modes: Spring less suspension systems often offer multiple driving modes or settings that allow drivers to customize the suspension response according to their preferences or specific driving conditions. This versatility enables drivers to switch between comfort, sport, or off-road modes, tailoring the suspension characteristics to suit their needs.

B. DRAWBACKS

1. Cost: Spring less suspension systems using bevel gears are generally more complex and expensive compared to conventional suspension systems. The incorporation of electronic sensors, actuators, and control systems adds to the overall cost of the system.
2. Maintenance and Complexity: The advanced technology and complexity of spring less suspension systems require specialized maintenance and diagnostic procedures. If any component of the system malfunctions or requires repair, it may involve higher costs and technical expertise.
3. Power Consumption: Active suspension systems utilizing bevel gears and electronic control systems consume electrical power to operate. This additional power demand can impact fuel efficiency and overall energy consumption of the vehicle.

C. USAGE

1. Off-Road Vehicles: The adaptability and enhanced traction provided by spring less suspension systems make them suitable for off-road vehicles, allowing for better control and stability on uneven or challenging terrains.
2. Sports Cars: Active suspension systems using bevel gears can be found in sports cars, where precise handling, stability, and agility are of utmost importance.
3. Electric and Hybrid Vehicles: Spring less suspension systems can be utilized in electric and hybrid vehicles to optimize ride quality and compensate for the additional weight of the battery packs.

XI. METHODOLOGY

- i. Literature survey
 - ii. Problem identification
 - iii. Assembling
 - iv. Testing
 - v. Components selection
- a. Literature survey: from various authors journals we studied to solve the spring less suspension for an automobiles
 - b. Problem identification: as when we go through various journals paper we found some problems in spring suspension system to over come from those problems we selected a bevel gear suspension system
 - c. Components selection : Bevel gears, Rubber visa wheels, wood plates, dc motors, two links and circuit
 - d. Analysis of forces: Find the forces acting on the each component of the machine and the energy transmitted by each component



- e. Assemble: assembling all components in proper way to get the desired product
- f. Testing: The final obtained product can be tested in all possible ways

XII. CONCLUSION

- (1) In conclusion, the concept of spring less suspension of an automobile using bevel gears holds promise as a potential innovation in the field of automotive suspension systems.
- (2) The use of bevel gears as a mechanical means of providing suspension without the need for traditional springs or dampers offers advantages such as reduced weight, simplified design, and potentially improved performance in certain conditions.
- (3) However, there are challenges and limitations to be addressed, such as the need for precise gear design and manufacturing, potential noise and vibration issues, and the need for comprehensive testing and validation.
- (4) Further research and development efforts are required to fully explore the potential of spring less suspension using bevel gears, including investigations into different gear configurations, materials, lubrication methods, and real- world performance.
- (5) With continued advancements in technology and engineering, spring less suspension using bevel gears could potentially become a viable option for future automotive suspension systems, offering improved ride comfort, handling, and overall vehicle performance

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