NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 10, ISSUE 6, June - 2024

MAKING OF DUAL AXIS VEHICLE STEERING MECHANISM

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ABSTRACT
Whether a car has front-wheel drive, rear-wheel drive, or all-wheel drive, the majority of current models use a two-wheel steering system to control their movement. However, four wheel steering vehicles are being employed more frequently as a result of increased safety awareness because they are also renowned for their outstanding performance and stability. They are wheels ofconventional two wheel steering vehicles do not assist with steering and simply follow the front wheels' route. In four-wheel steering, the wheels can be turned left or right depending on the situation. The direction of rotation for the rear wheels might be either parallel to the front or opposite. The four-wheel system is made to operate in three different ways. Specifically, rotations that are in-phase, out-of-phase, and zero.

INTRODUCTION

The front wheels of the vehicles receive steering control, though in some situations the rear wheels also receive steering control. The twin axle steering system demonstrates how various wheel motions in relation to various turning arrangements operate. The machine has three alternative steering configurations: neutral, adverse, and favorable. Only the front wheels run in the right or left direction during the neutral phase, with the rear wheels acting as the front wheels' followers. The front and rear axles move in opposition to one another during the negative phase. The front and rear axles are both in the positive phase relative to one other, they travel in the same direction. Here, we must lift the shifter and insert it into the appropriate slot to perform the necessary motion.

LITERATURE REVIEW

Prof. S. D. Bhaisare et al [1] One of the most crucial sectors for the development of a nation is the automobile industry. India's vast and diverse transportation sector presents its own set of issues. By combining energy- efficient technological improvements with a customerfocused strategy, these difficulties might be overcome.

The driver should constantly feel very comfortable when operating the car's cutting-edge features. The main factor in an automobile travelling faster than its cruising speed is steadiness. When a vehicle is moving at a high speed with a four-wheel navigation system, the likelihood of instability is increased by the tail wheels rotating anticlockwise to the forward-facing wheels. While fine-tuning the allwheel steering system, rear wheels follow the same path as the forward-facing wheels to prevent this instability. This essay sheds some light on the challenge that everyone wheel steering system turning in a relatively small area. The driver can make bends with a tiny turning radius by switching from two-wheel to four-wheel steering. It is also relaxed enough to allow for easy moving in parallel parking and on motorways. In order to accomplish this, a mechanism was created with two bevel gears, an intermediary shaft, and tail wheels that are turned in and out of alignment. After upgrading to a four-wheel steering system, the vehicle's spiraling radius is just 2596 mm, compared to the two steering wheel vehicle's 4400 mm spiraling radius. So, the radius was decreased to 1804 mm. Subramaniyam Vasamsetti et al [2] In order to solve the parking and traffic issues that plague urban mobility, an effort was made to suggest a suitable compact automobile model in this project work. In this project, the chassis of an existing hatchback car is changed appropriately. Two seats with two doors, a luggage boot, and trimmed corners make up the single box section. Weight loss saved production costs and increased mileage. Each wheel has a coupling that allowed it to steer around a single instantaneous centre. With a turning radius of about 2.9 meters, this design made the vehicle easy to control and very agile. This system prolongs the life of the wheel bearings and tyre. MAKING OF DUAL AXIS VEHICLE STEERING MECHANISM V.V.P.I.E.T, SOLAPUR . 4 Venkatesh Reddy et al [3] An enhancement to this system would undoubtedly be a brandnew eco friendly car that allows wheelchair users to travel independently in low- emission vehicles. To do this, a green vehicle must be identified, perhaps an electric car that can turn through 90 degrees with little effort. The modern automobile lacks the ability to steer through a 90-degree angle. These automobiles can successfully assist impaired individuals. Numerous studies have been conducted in this area to put this concept into practice, but this has not yet happened. the concept is to build a counter phase system and employ electric motors on any two diagonal wheels. The mechanism only operates at low speed. One of this system’s benefits is that it can it takes less time and effort to steer through a 90-degree angle, allowing it to operate in constrained spaces and increasing the system's flexibility. It can also be used for parking, farm vehicles, trucks, forklifts, and other things.

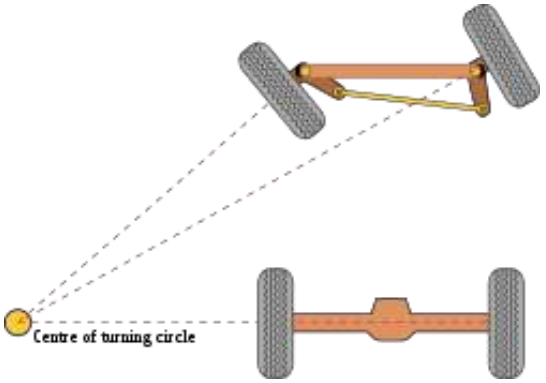


Figure 2.1 : Two Wheel Steering

Pushkin Gautam et al [4] A relatively new technology that enhances maneuverability in cars, trucks, and trailers is selectable all wheel steering. Although this sort of steering system allows for steering on both two wheels and four wheels, all wheel steering is often employed for parking and low-speed manoeuvres. The improved version of aws is called "selectable all wheel steering" (all wheel steering). According to the needs of the driver, the four wheels can be engaged and disengaged like this. This offers both two wheel and four wheel steer advantages. As a result, it can be used as front wheel steer in long straightaways and as all wheel steer in tight curves. The mechanically operated saws configuration is one of several without requiring major adjustments to the four wheel steering system, one of the most cost-efficient and portable systems that can be fitted in an atv.

[5] K. Vinoth Kumar et al., Our project's goal is to develop a multimode steering system to decrease the over- turning radius of cars while they are being steered (4ws). In a typical steering setup, a hand operated steering wheel that is placed in front of the driver is used to turn the front wheels. The collapsible steering column, which has a universal joint, is a component that enables it to deviate from a straight path in accordance with the road. With the multimode steering system, two steering modes may be switched as needed, making it easier to park in busy areas and while having a small turning radius both on and off the road.

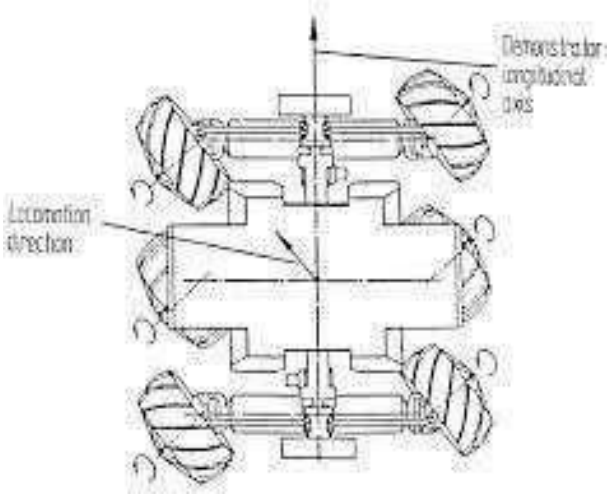


Figure 2.2 : Crab Steering

Bhavesh K.Gohil et al [6] Currently, we employ a two-wheel steering system for cars, and in a twowheel steering system, the back wheels are idle and serve no steering purpose. The front and rear wheels in a four wheel steering system are both active and can steer. Here, the maruti-800 automobile is used as a model.In order to improve the maneuverability of a sedan in relation to its speed, we have developed an optimized 4 wheel steering system for implementation of a mechanism that can give the work in changing the in-phase and counter-phase steering of rear wheels depending upon Sachin Saxena et al [7] In contrast to the 2-wheel steering used in India's traditional automobiles, the 4- wheel steering system is the focus of this study. A 4- wheel drive is entirely distinct from a 4wheel steering (in which each wheel is given power rather than to 2 wheels). In comparison to a 2wheel steering system, a 4-wheel steering system is superior. Both the turning radius and the turning space are reduced. It also makes it possible to switch lanes

while driving, even at a high rate of speed. In a university in Egypt, this paper is currently being researched. For the purpose of solving the parking issue in major cities, we intend to construct an electric vehicle in this project with wheels that can rotate up to 90 degrees. This automobile will be a unique utility vehicle that can operate with both two and four wheel steering. the condi Eng. Biagio Borretti et al [8] The dana intelligent twin steering system for mobile vehicles with two steering axles is discussed in this article (i.e., with four steering wheels). The two steering cylinders in today's four wheel-steering cars are normally connected in series in a hydraulic system. This kind of connection reveals some restrictions on the amount of power that can be used, the comfort of the steering, and the ability to enable sophisticated working tasks. This form of hydraulic design was developed by dana, who also made it possible to detach the rear axle from the front one. In this way, the rear axle, under electronic control of its valve block, enhances the performance of the steering system and adds more sophisticated steering features than the traditional steering systems.tion of turning and lane changing with respect to front wheels. MAKING OF DUAL AXIS VEHICLE STEERING MECHANISM V.V.P.I.E.T,
SOLAPUR . 7 Er. Amitesh Kumar et al [9] Ackerman or davis steering systems are used in conventional steering mechanisms. The smallest turning radius that can be achieved by the steering action with these systems is a drawback. Using a four wheel steering system eliminates the complexity associated with traditional steering techniques. In this method, the wheels attached to the front axles and the rear axle are rotated in opposition to one another. The wheels on the vehicle's left half turn in one direction, while the wheels on its right half turn in the opposite direction. With this wheel configuration, the vehicle can turn 360 degrees without veering from its current position. There is no turning radius for the vehicle. This makes it easier to handle the car in confined areas like parking lots and small communities.

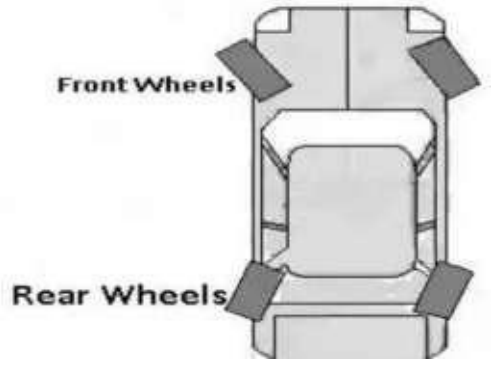
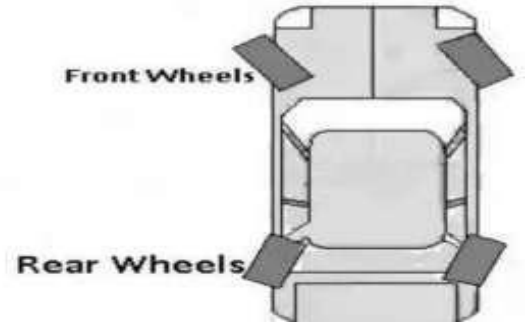


Figure 2.3 :Four Wheel Steering

METHODOLOGY



The study has been carried out with the following steps: (a) Background Theory: The steering mechanism consists of rack and pinion arrangements which are used to turn the wheels in the front. And a bevel gear arrangement is made just after the steering and power is transmitted to the transfer shaft to the gear box assembly. Then power is transmitted to the rear wheels. Layout/Operation of the system: Two subsystems: Rack and pinion for front and rear, identical geometry and components. Steering column is fitted with 3 bevel gears meshes and transmits power to front and rear rack and pinion. As steering wheel is turned the entire rotation is transmitted to front rack and pinion and only half of the rotation is transferred to rear rack and pinion. i. Ackermann Steering Mechanism Ackermann steering mechanism is a geometry arrangement of linkages in the steering of vehicle designed to solve the problem of wheels on the inside and outside of a turn needing of different radius. The intention of Ackermann geometry is to avoid the need for tires to slip sideways when following the path around a curve. The geometrical solution to this is for all wheels to have their axles arranged as radius ofcircles with a common centre point. As the rear wheels are fixed, this centre point must be on aline extended from a rear axle. Intersecting the axes of the front wheels on this line as well requires that the inside front wheel is turned, when steering, through a greater angle than the outside wheel. ii. Gear Reduction A reduction gear is an arrangement by which an input speed can be lowered for requirement of slower output speed, with same or more output torque. iii. Turning Radius The turning radius of a vehicle is the radius of the smallest circular turn (i. e U-turn) that the vehicle is capable of making. iv. Steering Geometry Steering geometry is the geometric arrangement of the parts of a steering system and the value of the lengths and angles
Within it. Steering geometry changes due to bumps in the road may cause the front wheels tosteer in a different direction together or independent of each other.

MODELING AND ANALYSIS

Figure: Actual model.

RESULTS

The development of Dual Axis Vehicle Steering Mechanism has been completed in CATIA. The model has been analyzed by using static structural analysis for the future production processes. Because of the hallow square pipes used in the model the weight of the product is automatically reduced. The maximum deformation and equivalent elastic strain is checked in static structural analysis by using ANSYS workbench.

CONCLUSION

DISCUSSION: It is appropriately done in good manner. The main objective of reducing cost and weight is achieved. Now this is economical for the user. In future there will be so many applications of this support.

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