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To Study of 360 Degree Steering Vehicle Mechanism

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Abstract

Design and construction of an advanced steering system that allows us to turn our car while standing with the least amount of space possible. In this study, four independent motors power the four wheels. One additional high torque DC motor, installed on the top portion of the chassis, controls the direction of these four wheels. A wired remote control is used to operate each of these five motors. The vehicle can be rotated or turned around 360 degrees while standing thanks to a similar improved mechanism, which will be very helpful when parking and driving in congested areas.

KEYWORD: Pinions, Dc motors, chain drives, and bearings.

I. Introduction

The automotive industry has seen a number of changes as a result of the new, sophisticated technology. Among these, the zero-degree turning radius is being examined in a number of automobiles. G. JCB, Nano Pixel, hurricane jeep, and so forth [1]. The diameter that the outside wheels of a car describe when it is turning on full lock is known as the turning circle. The turning circle radius can be computed using the following formula, though there isn't a precise one: turning circle radius = (track/2) + (wheelbase/sin (average steer angle).

When a vehicle's turning radius is zero, it means that it is rotating around an axis that passes through its center of gravity. E. The car continued to turn at the same spot where it was standing. [2] Normal wheel vehicles lose time due to a variety of issues, such as parking and U-turning. Because of this, we have developed a vehicle with 360-degree wheel rotation to reduce and eliminate problems in the workplace and in personal life.

[3] The two most common steering mechanisms are the Davis and Ackerman steering systems. One drawback of these systems is the smallest turning radius that the steering action can achieve.

By using a four-wheel steering system, this challenge that comes with traditional steering techniques is removed. According to this arrangement, the wheels attached to the front and rear axles are oriented in opposition to one another. The wheels on the vehicle's right half rotate in the opposite direction from those on the left half, which rotate in one direction. The vehicle can turn 360 degrees thanks to this wheel arrangement without ever leaving its current position. e. The car's turning radius is zero.

This makes it easier to maneuver the car in confined areas like parking lots and small compounds. Controlling the angular motion of the wheels, directing the vehicle's motion, providing directional stability while driving straight ahead, facilitating straight ahead conditions after a turn, and damping down road irregularities to the greatest extent possible are just a few of the steering wheel's many functions.

II. Literature review

[1] SARVIND KUMAR[1] ANURAG RANJAN[2] UJJWAL KUMAR[3] Wherever Times is specified, Times Roman or Times New Roman may be used. If neither is available on your word processor, please use the font closest in appearance to Times. Avoid using bit-mapped fonts. True Type 1 or Open Type fonts are required. Please embed all fonts, in particular symbol fonts, as well, for math, etc.

[2] Jaishnu Moudgil presented a- 360-degree rotating car to overcome the problem of parking space. This car has zero degree turning radius of a vehicle implies the vehicle rotating about an axis passing through the center of gravity of vehicle i.e. the vehicle turning at the same place, where it is standing. No extra space is required to turn the vehicle. So vehicle is to be turned in the space equal to the length of the vehicle itself. In this presentation, so got idea of 360-degree wheel rotation vehicle and have plane to make 360-degree wheel rotation load carry vehicle, this vehicle is to be used in different area like industries, hospital, railway platform, etc.

[3] **Ataurrahman Ansari-** Conventional steering mechanism involves either the use of Ackerman or Davis steering systems. The disadvantage associated with these systems is the minimum turning radius that is possible for the steering action. This difficulty that is associated with the conventional methods of steering is eliminated by employing a four-wheel steering system. In this system, the wheels connected to the front axles are turned opposite to each other, and so are the wheels connected to the rear axle. The wheels on the on left half vehicle rotate in one direction and the ones on the right half of the vehicle rotate in the opposite direction. This arrangement of the wheels enables the vehicle to turn 360 degrees, without moving from the spot, i.e. the vehicle has zero turning radius.

[4] **Ansari Rehan1 , Rafiuddin Khan2** - At high speed, when steering adjustments are subtle, the front wheels and the rear wheels turn in the same direction. By changing the direction of the rear wheels there is reduction in turning radius of the vehicle which is efficient in parking, low speed cornering and high-speed lane change. In city driving conditions the vehicle with higher wheelbase and track width face problems of turning as the space is confined, the same problem is faced in low speed cornering.

[5] **Dr.Dinesh.N.Kamble** - Proposed the idea of all electric concept of vehicle is that if it becomes a reality would prove to be a lot of fun to drive in the city. The vehicle works on 8 electric motors, four motors attached uniquely to each wheel and it can rotate 360 degrees. The wheels of the car are magnetically coupled and it is controlled by magnetic fields. Hence the car is rotate firstly and effectively

III Objective

We have taken into account a number of goals when creating this steering mechanism, with the primary goal being to introduce specific steering method solutions. There are several restrictions on the steering radius of existing steering methods.

- To provide hassle free steering mechanism to achieve steering of vehicles with minimum available space.
- Reduce the amount of fuel wasted during steering.
- To solve the problems of parking in metropolitan areas and driving on busy street and marketplace.
- To make room for an enhanced steering mechanism that provides a simple and precise steering mechanism.

IV Problem Identification

A High turning radius vehicles have trouble parking and cornering at low speeds because of their wider

wheels and tracks, but passengers prefer them because they are more comfortable. In this case, four-wheel steering will work well because it will reduce the turning radius for the same vehicle with a larger wheel base. In order to reduce turning radius and implement four-wheel steering without altering the vehicle's dimensions, a benchmark vehicle is taken into consideration in this project. In urban areas, traffic is the primary issue. It takes a long time to get out of this condition, and in some emergency situations, like hospital or fire safety conditions, it can be challenging. When two cars are parked next to each other with space between them, it can occasionally be challenging to park a car in a conducive environment. As a result, this illness also takes up time for the lifestyle.

V Working of steering system

Steering is a system of components, linkages, etc. This allows any vehicle to follow the path desired. The purpose of the steering system is to allow the driver to steer the vehicle on desired path. The steering system converts the rotation of the steering wheel into a swiveling motion of the road wheels so that the steering-wheel rim turns a long way to move the road wheels a short way. This system allows a driver to steer a heavy car with only light forces. A 15 in. rim. The steering wheel that moves four turns from full left lock to full right lock travels nearly 16 ft (5 m), while the edge of a road wheel moves only slightly more than 12 in. (300 mm). If the driver swiveled the road wheel directly, he or she would have to push nearly 16 times as hard. The steering effort is transmitted to the wheels through a series of pivoted joints. These are designed to allow the wheels to move up and down with the suspension without changing the steering angle. They also ensure that when cornering, the inner front wheel (which must travel round a tighter curve than the outer one) is sharply angled. The joints must be adjusted very precisely, and even a little looseness in them makes the steering dangerously sloppy and inaccurate. Two common types of steering systems are the rack and pinion and the steering box. On large cars, either system may be power assisted to reduce the additional work needed to move it, especially when it is driven by a large car, especially when it is driven by a large car..

Conditions for true rolling or correct steering angles-

- All four wheels rolling flawlessly under all running conditions is the result of perfect steering.
- If the axis of the front wheels meets the axis of the rear wheels at one point during taking turns, the condition of perfect rolling is met.
- This point is then the vehicle's instantaneous center. It is evident that the inside wheel requires a greater angle of tilt than the outside wheel.
- The turning angle decreases as the steering angle increases.
- The steering angle can only be as high as 44°.
- Extreme positions are referred to as lock positions on both sides.
- The turning circle is the smallest circle that the car's outer front wheel can trace in extreme conditions; the turning radius is the diameter of this circle.

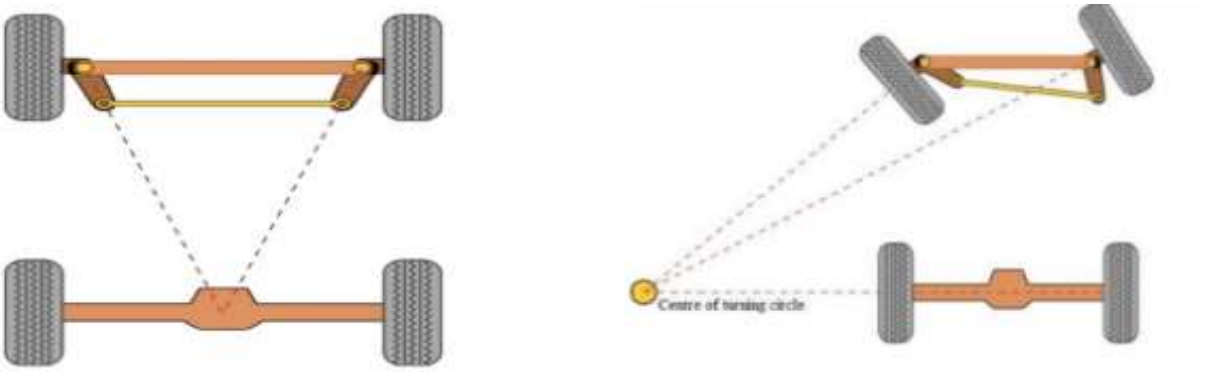

Fig 1.1 Basic Steering Mechanism

By transforming the rotation of the steering wheel into a swivel motion, the steering system enables the road wheels to shift a short distance while the steering wheel rim rotates significantly. A network of pivot joints facilitates the transfer of steering effort to the wheels. These joints are designed to allow the wheels to move vertically with the suspension without altering the steering angle. Furthermore, they ensure that the inner front wheel, which must navigate a tighter curve than the outer wheel, is angled more sharply during cornering. Even minor looseness in the joints can lead to dangerously imprecise and sloppy steering, necessitating extremely careful adjustments. The two prevalent steering systems are the steering box and the rack and pinion. To further reduce the effort needed to maneuver a large vehicle, especially at low speeds, either system may be equipped with power assistance.

Methods used for 360° Rotation- The car's rear tires should rotate at least 25 to 30 degrees in the opposite direction of the front tires to make turning easier. A dc motor, which also displays the steering motor, is used to rotate tires in the opposite direction. This motor assists in turning tires at the driver-recommended angle. The driver will be holding switches for both steering motors so he can turn the back tires to the desired rotation angle. The steering motor configuration is as follows: 52 w of power, 1200 rpm of speed, and -6 v of voltage. A rack and pinion system is used to rotate the tires on the front end. In order to increase tire rotation, the rack's length is increased while keeping in mind the relationship ($\theta = 8\ t/l$, where t = track width and l = wheelbase) [2]. The normal rotation of the rack and pinion arrangement is between 25 and 35°. The Ackerman steering system uses this relationship to make it easier for the outer tires to rotate than the inner tires.

VI Advantage

- It takes a very short amount of time to change directions.
- It is more effective than other kinds of load-carrying vehicles.
- It is simple to park this kind of load-carrying vehicle in any direction.
- It's a less expensive load-carrying vehicle.
- Environmentally friendly.
- Fuel was not needed because the battery operated. &More efficient.
- This 360-degree wheel rotation vehicle is a type of pollution-free vehicle because it runs on a battery to move forward and backward.

VII Application

- In sectors like automated guided vehicles that automate raw material processing.

- Due to the industry's space constraints, a variety of vehicles are used in the automobile sector to transport goods from one location to another. This particular vehicle is utilized in automobile applications because it takes up comparatively less space than other vehicle types.
- This vehicle is utilized in small industries to move raw materials from one location to another.
- Modern Indian society's economic growth and development have led to a rise in the number of vehicles in parking lots, which is another issue. Other vehicles in the park require more room to move from one direction to another, but 360-degree wheel rotation vehicles can move parallel, making it simple for them to move between directions. Take easily U-turn because front wheel of this vehicle is rotating freely by steering, chain drive and sprocket arrangement.
- In hospitals, it is employed to transport patients between rooms. due to the fact that many patients are lodging in a single room.
- Make a U-turn with ease because the steering, chain drive, and sprocket arrangement allow the front wheel to rotate freely.

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