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90 Degree Steering System

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***Abstract*: The Car design proposal has swing 90 degrees. It can pull up alongside a parking space and drive in sideways. 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 90 degree steering system. This innovation promises to ease the task of parking on narrow streets. The most striking elements of the car are wheels that incorporate electric motors and the suspension inside their circumference. By working through the problem so logically and indeed unemotionally we will anticipate discovering new possibilities. "We want to step back and rethink the automobile from scratch. The process is like diagramming a sentence steering and so on. The goal is to dissect the structure of the car and look at it afresh." The wheels drive-by-wire controls that replace mechanical links to the brakes and throttle with electronic connections.**

***Keywords*: steering system**

1. Introduction

Now a day's four-wheel parking is the most difficult problem, when we travel in the city. If frequently parking spots are located on the side of the road, leaving the driver with no option, but to attempt parallel parking .it is challenging to the driver for parking it require vehicle to take in reverse direction and it difficult to stand in correct motion of the car. Some driver is expert in parking the vehicle at the road but other driver has to perform multiple correction before they park the car properly. In the worst case an accident can occur. A car with 90 degree steering system saves the driver time and effort, those who are not perfect in parallel parking. In present days in automotive sector 90 degree steering system is not implemented. A lot of researches have been done on this field for implement these systems. The idea is to use the four motor attach wheel for turning the wheel in 90 degrees. This mechanism is works at low speed or at stationary position of vehicle.

2. Problem statement

Due to many number of cars and conjucted space available in city that's the reason of parking difficulty for any driver. The mostly used type of steering, are using the front two wheels of the vehicle. This type of steering mechanism requires larger turning circle radius it require high effort to turn the wheel.

Motor mechanism design has the advantage of a large degree of turning radius circle. Due to high turning radius, parking is difficult. In small parking area it is difficult to steer and park. Thus to overcome this problem, we design the new steering mechanism which can steer the four wheels individually by using the motor mechanism.

3. Objectives

The aim is to create the specifications of the 90 degree steering system for transverse parking system. As part of the need of the project numbers of goals were produces to measure the success of the project. The main objectives of this project are as follows:

1. Better parking in home in minimum space.
2. This type of vehicle we can use in heavy traffic also.
3. Saving time.
4. Saving fuel.
5. Use of electrical equipment to increase efficiency.
6. Vehicle can steer easily.
7. Maintenance of this vehicle is very low.

4. Working

In this project battery provides the power supply to the control unit. The equipment contains totally five motors, two motors coupled with the vehicle's left and right wheels of the front side, the next two motors are connected to the vehicle's left and right side of the back side. The four motors are used to run the vehicle. Another one motor is connected to rotate the vehicle rear wheel 90 degree by the chain drive arrangements. The front wheel is controlled by the steering system which rotates both the wheel to 90 degrees in both side. The rear wheel is controlled by the chain drive management, two bevel gears, sprocket and motor. The motor rotates the bevel gear which again rotates the second bevel gear through shaft. The sprocket is attached to second bevel gear through another shaft which also rotates along with gears. The sprocket is connected to other sprockets by chain which rotates the rear wheel.

In heavy traffic performance of steering system need powerful working without extra effort that's why we design this project or prototype of four-wheel electric steering system with 90-degree electric powered steering system. In the project total

4DC motors are used. The motors are used for transmission to alternative wheel of vehicle when key is operated by operator so that the wheels can operate properly. The wheels can move forward, backward, left and right direction.

Fig. 1. Experimental setup

5. Component

1) Frame

It is made up of mild steel rectangular rod. The inner frame takes weight of battery, and all other components of the system. Its External dimensions are 600 mm X350 mm.

Fig. 2. Frame

2) Wheel

Steering wheel handles the steering operation. It is made of plastic material outer over if rubber for moving the vehicle.

Fig. 3. Wheel

3) Rack and pinion

A rack and pinion is type of linear actuator that comprises a circular gear (the pinion) engaging linear gear (the rack) which operates to translate rotational motion into linear motion. Driving the pinion into rotation causes the rack to be driven linearly. Driving the rack linearly will cause the pinion to be driven into a rotation.

Fig. 4. Rack and Pinion

4) Bearing

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

Fig. 5. Bearing

5) Chain

A bicycle chain is a roller chain that transfers power from the pedals to the drive-wheel of a bicycle, thus propelling it. Most bicycle chains are made from plain carbon or alloy steel, but some are nickel-plated to prevent rust, or simply for aesthetics.

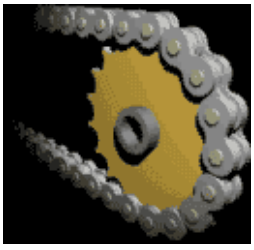

Fig. 6. Chain

6) Sprocket

A sprocket or sprocket-wheel is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing

over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth.

Fig. 7. Sprocket

7) Bevel gear

Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.

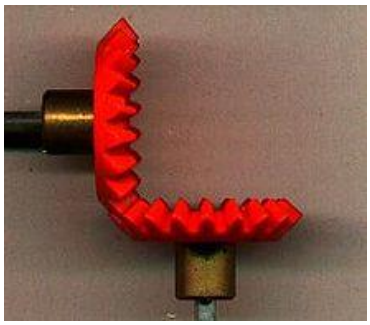

Fig. 8. Bevel gear

8) DC motor

DC motor stands for Direct Current. A machine in which electrical energy into mechanical energy.

We use the two types of motor:

i. 500 RPM speed motor.
ii. 200 RPM speed motor.

Fig. 9. DC motor

9) Battery

A battery which is convert chemical power into electrical power. We use the rechargeable battery of 12V 1.3A.

10) Advantages

1. It improves cornering stability.
2. High speed straight line stability.
3. Improvement in rapid lane changing.
4. Smaller turning radius improves steering efficiency.
5. Comfortness increases from driver point of view.
6. Improved the traction and handling ability.

11) Disadvantages

1. Require eight motors
2. Only used in individual drive system.

12) Application

1. Electric vehicles
2. Parallel parking
3. Slippery road surface
4. GO kart (mini race car)

6. Conclusion

We know that wheel motion is not possible in 90 degrees, but by using various speed motors we can turn the wheel in 90 degree that's why we can easily park the vehicle inside a lane or between two vehicles with a small parking slot in between. From this project prototype we can create a low cost and user friendly vehicle. Also material used in this project is easy to manufacture or easily available in market, and it is low in cost. The vehicle weight is light and we can implement in car.

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