90 Degree Steering Mechanism

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Abstract- *The increase of the maneuverability when parking the vehicle is achieved by means of 4-wheel steering, meanwhile the increase of the driving stability at higher speeds is achieved through concordant steering front wheels. A disadvantage of this so-called passive steering system is that it operates even when driving in straight direction when single wheel of an axle hits surface irregularity. In this project we make frame from square bar. Arrange steering system at front and rear side. When steering wheel will be rotate, then bevel gear will be rotate. Bevel gear is used to transmit vertical motion into horizontal rotating motion. Bevel gear drive shaft provides same rpm to pinion. Pinion will rotate the rack. At the both end of the rack two pinion is meshed. Due to linear motion of the rack direct angular motion given to the end racks. Each of the end rack have the steering linkages are provided. Power transmitted by the bevel gear is directly give to rear axle steering system which have same mechanism like front wheels.*

Keywords- steering system, 4-wheel steering, Bevel Gears

I. INTRODUCTION

The advanced new technology has led to various modifications in the automobile sector. Out of these, zero degree turning radius which is being analyzed in various vehicles e.g. hurricane jeep, JCB, Nano Pixel etc. The turning circle of a vehicle is the diameter described by the outside wheels when turning on full lock. There is no hard and fast formula to calculate the turning circle but it can be calculated using this; Turning circle radius= (track/2) + (wheelbase/sin (average steer angle)). 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 can be turned in the space equal to the length of the vehicle itself.

This arrangement of the wheels enables the vehicle to turn 360 degrees, without moving from the spot, i.e. the vehicle has 900 turning radius. This helps in maneuvering the vehicle in tight spaces such as parking lots and within small compounds.

II. PROBLEM STATEMENT

The most frequently used type of steering, are using the front two wheels of the vehicle. This type of steering suffers from the comparatively larger turning circle and the extra effort required by the driver to negotiate the turn. Many of the metro and urban city people are face problems in the traffic due to numbers of the vehicle and limited space for turning.

Some types of industry battery trucks and industry backhoe loaders use this type, where only the two rear wheels control the steering. It can produce smaller turning circles, but is unsuitable for high speed purposes and for ease of use.

Many modern cars use rack and pinion steering mechanisms. Four-wheel steering system used in electric car which is manufactured by Mahindra and Tesla Company. They required high maintenance cost, due to use of sensor for giving steering angle.

III. 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.

IV. WORKING

90 degree steering mechanism basically helps to reduce the space required for a person to steer his vehicle. Our project of Fabrication of modified steering and drive mechanism for turning wheels through 90 degree in parallel parking, is a combination of front steer drive for normal driving and four wheels steering for 90° turning. 90° steering mechanism is

especially designed to decrease turning radius for parking purposes in confined spaces. For our project we are using rack and pinions, differentials, bevel gears and other essential linkages in different arrangements as discussed below. A. Steering mechanism For steering of our vehicle we are using a special set of rack and pinions joined with two sets of steering arms L1, L2, L3 and L4 attached to the wheels on each sides of vehicle i.e. front and rear side. For steering of the vehicle, the steering wheel S1 will be connected through a steering shaft to steering bevel gears DS, and the shaft from DS will connect the two pinions P1 and P2.when steering wheel is rotated in clock wise direction, the motion is transferred to the front pinion shaft(during normal drive) which rotates pinion in clock wise direction due to which rack will slide towards left side and wheels will turn towards right side. Now the thickness of the pinions are sufficient to compensate the forward movement of rack. The two modes of steering are –1) Normal steering 2) 900 steering In case of normal steering the control will be at the front side of the vehicle thus our vehicle will turn by turning the steering wheel. During normal mode hand lever which is engaging engagement pin EP1 remains in the disengaged position and steering is only provided to the Front wheels.

Fig. 1. Experimental setup

V. 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.

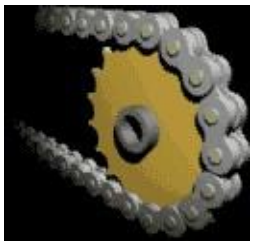

Fig. 6. Chain

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 degree apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.

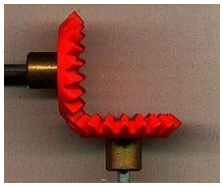

Fig. 8. Bevel gear

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. Applications

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

VI. 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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