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Design and Fabrication of "360 Degree Car Parking"

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Abstract--- *Modern development and economical progression of Indian society resulted in increase of cars on rods. Due to space constraints, car parking is the major problem faced in most parts of the country. Present study aims for development of a system to reduce the turning radius of a car. The indigenously developed system consists of Ackerman steering and chain drive mechanism with arrangement of the various kinematics links. In this system at first vehicle is stopped and wheels are then turned in the required direction with the help of steering system. It has turning radius nearly equal to negligible of the length of car itself. This system can be useful in better parking, traffic jam, back turning on narrow roads, etc.*

Keywords--- *Car Parking, Design and Fabrication, Properly and Quickly, Parking Spaces.*

I. INTRODUCTION

Parking is the act of stopping and disengaging a vehicle and leaving it unoccupied. Parking on one or both sides of a road is often permitted, though sometimes with restrictions. Some buildings have parking facilities for use of the buildings' users. Countries and local governments have rules for design and use of parking spaces.

Generally vehicle parking is done by manually and it is not automatic. Due to the manually vehicle parking system there may occur misalignment in parking and it is difficult to park in crowded place.

Normal steering mechanisms are not able to park our vehicle properly and quickly.

The existed steering mechanisms are:

1. Worm and wheel steering gear
2. Worm and roller steering gear
3. Worm and sector steering gear
4. Cam and lever steering gear
5. Rack and pinion steering gear
6. Re circulating ball steering gear

1. Worm and wheel steering gear

In this type of steering gear box there will be worm at the bottom end of steering inner column. This worm meshes with a wheel in steering gear box housing. When steering wheel turned, the steering column revolves and the wheel is rotated along with it. This causes the drop arm to move and thereby move drag link and other steering linkages like Tie-rod king pin etc.

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2. Worm and roller steering gear

In this steering gear, there will be a worm at the bottom end of inner column and a roller is there in the steering gear box. When the worm rotates, the roller which is attached to it also rotates causing the Roller to rotate and there by moving drop arm.

3. Worm and sector steering gear

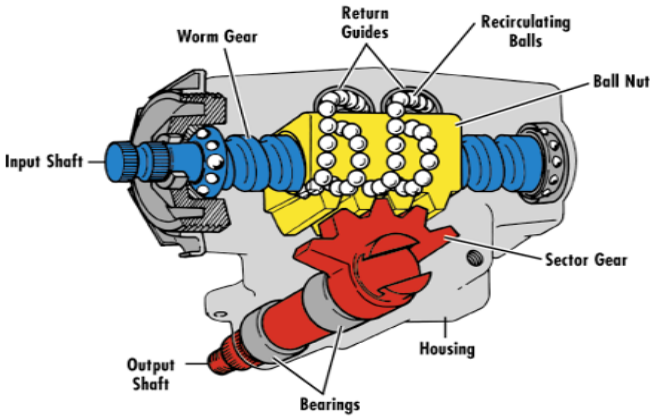
In this type of steering gear, there will be a worm at the bottom end of steering inner column and a part of sector shape is there in the steering gear housing. The worm meshes with sector and it moves by the rotation of worm and thereby moving drop arm which is attached to it.

4. Cam and lever steering gear

In this type of steering gear, a special worm called cam is located at the end of inner column which it attached to column in the steering gear. When the worm is rotated, the lever is also moved in the groove provided in the worm. This causes the lever to swing through an arc.

5. Recirculating Ball Steering Gear

In this steering gear there will be some steel balls in the grooves of steering inner column which move along with the steering worm. This enables to control the friction among them and thereby reducing noise. It increases the mechanical advantage of the operator for easy and smooth operation of steering.



6. Rack and pinion Steering gear

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In this steering gear, a pinion is mounted at the end of the steering inner column. It engages the rack which has ball joints at each end to allow the rise and fall of the wheels, the rods are connected with ball joints to the sub axles. The rotary movement of steering wheel turn the pinion which moves the rock sideways parallel to tie rod.

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 technology exists in heavy earth movers like excavator which consists of two parts i.e. the upper part cabin and lower part crawler chain. The upper part of excavator can rotate about its center, so that the direction of cabin can be changed without changing direction of lower part. Conventional steering mechanism involves either the use of Ackerman or Davis steering systems.

II. LITERATURE SURVEY

Jaishnu Moudgil, Shubhankar Mengi, Mudit Chopra, Dr. Jaswinder Singh

"360° ROTATING VEHICLE TO OVERCOME THE PROBLEM OF PARKING SPACE"

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 technology exists in heavy earth movers like excavator which consists of two parts i.e. the upper part cabin and lower part crawler chain. The upper part of excavator can rotate about its center, so that the direction of cabin can be changed without changing direction of lower part. 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. This helps in maneuvering the vehicle in tight spaces such as parking lots and within small compounds.

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K. Lohith, Dr. S. R. Shankapal, M. H. Monish Gowda

"DEVELOPMENT OF FOUR WHEEL STEERING SYSTEM FOR A CAR":

Education cars are designed to understeer and rarely do they oversteer. If a car could automatically compensate for an understeer/oversteer problem, the driver would enjoy nearly neutral steering under varying operating conditions. Four-wheel steering is a serious effort on the part of automotive design engineers to provide near-neutral steering. Also in situations like low speed cornering, vehicle parking and driving in city conditions with heavy traffic in tight spaces, driving would be very difficult due to vehicle's larger wheelbase and track width. Hence there is a requirement of a mechanism which result in less turning radius and it can be achieved by implementing four wheel steering mechanism instead of regular two wheel steering. In this project Maruti Suzuki 800 is considered as a benchmark vehicle. The main aim of this project is to turn the rear wheels out of phase to the front wheels. In order to achieve this, a mechanism which consists of two bevel gears and intermediate shaft which transmit 100% torque as well turns rear wheels in out of phase was developed. The mechanism was modelled using CATIA and the motion simulation was done using ADAMS. A physical prototype was realised. The prototype was tested for its cornering ability through constant radius test and was found 50% reduction in turning radius and the vehicle was operated at low speed of 10 kmph.

Saket Bhishikar, Vatsal Gudhka, Neel Dalal, Paarth Mehta, Sunil Bhil, A.C. Mehta

"Design and Simulation of 4 Wheel Steering System":

In standard 2 Wheel Steering System, the rear set of wheels are always directed forward and do not play an active role in controlling the steering. While in 4 Wheel Steering System, the rear wheels do play an active role for steering, which can be guided at high as well as low speeds. Production cars are designed to under steer and rarely do they over steer. If a car could automatically compensate for an under steer/over steer problem, the driver would enjoy nearly neutral steering under varying operating conditions. Also in situations like low speed cornering, vehicle parking and driving in city conditions with heavy traffic in tight spaces, driving would be very difficult due to a sedan's larger wheelbase and track width. Hence there is a requirement of a mechanism which result in less turning radius. We have developed an innovative 4 wheel steering design to implement a mechanism that can serve the purpose of changing in-phase and counter-phase steering of rear wheels depending upon the conditions of turning and lane changing with respect to front wheels, thus enhancing the maneuverability of a sedan in accordance with its speed. Our 4 Wheel Steering System gives 64.4% reduction in turning circle radius of a sedan which is reduced from 5.394m to 1.92m, considering HONDA CIVIC as a standard car for our calculations, and steering ratio thereby obtained is 8.177:1 which gives much better maneuverability and control on the car even while driving at high speeds.

S. NITHYANANTH, A. JAGATHEESH, K. MADAN, B. NIRMALKUMAR

"CONVERTABLE FOUR WHEELS STEERING WITH THREE MODE OPERATION":

The most conventional and general steering arrangement is to turn the front wheels using a hand– operated steering wheel which is positioned in front of the Driver. The steering column, which contain a universal joint which

is part of the collapsible steering column which is designed to allow it to deviate from a straight line according to the Roadmap. In CONVERTIBLE FOUR WHEEL STEERING WITH THREE MODE OPERATION three steering modes can be changed as needed which assists in parking at heavy traffic conditions, when negotiating areas where short turning radius is needed and in off road Driving.

Arun Singh, Abhishek Kumar, Rajiv Chaudhary, R. C. Singh

"Study of 4 Wheel Steering Systems to Reduce Turning Radius and Increase Stability":

Nowadays, every vehicle existed mostly still using the two-wheel steering system to control the movement of the vehicle whether it is front wheel drive, rear wheel drive or all-wheel drive. But due to the awareness of safety, four wheel steering vehicles are being used increasingly due to high performance and stability that they bring to the vehicles. In this report, the performance of four wheels steered vehicle model is considered which is optimally controlled during a lane change maneuver in three type of condition which is low speed maneuver, medium speed maneuver and high speed maneuver. Four-Wheel Steering – Rear Wheels Control. For parking and low-speed maneuvers, the rear Wheel steer in the opposite direction of the front wheels, allowing much sharper turns. At higher speeds, the rest wheels steer in the same direction as the front wheels. The result is more stability and less body lean during fast lane changes and turns because the front wheels don't have to drag non-steering rear wheels onto the path

Er. Amitesh Kumar, Dr.Dinesh.N.Kamble

"Zero Turn Four Wheel Steering System":

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. This helps in maneuvering the vehicle in tight spaces such as parking lots and within small compounds.

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