THREE MODE STEERING SYSTEM FOR LIGHT WEIGHT AUTOMOBILE VEHICLES

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Abstract
This Steering is the term applied to the collection of components, linkages, which will allow for a vehicle to follow the desired course. An exception is the case of rail transport by which rail tracks combined together with railroad switches provide the steering function. The most conventional steering arrangement is to turn the front wheels using a hand–operated steering wheel which is positioned in front of the driver. Other arrangements are sometimes found on different types of vehicles, for example, a tiller is rear–wheel steering. Tracked vehicles such as tanks usually employ differential steering that is, the tracks are made to move at different speeds or even in opposite directions to bring about a change of course. In convertible four wheel steering with three mode steering 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.

Keywords: three mode steering, parallel parking, short turning radius.

I. INTRODUCTION

Nowadays, the condition of increasing road traffic makes the handling of vehicles more difficult. The present scenario demands an exploration of new vehicle handling mechanism, which in turn forces us to find out an alternative way instead of current system or a modified steering mechanism for better handling. While the vehicle enters a congested or narrow area there would be no one who doesn’t wish for, if they would be able to reduce the turning radius of their vehicle or if they could move the whole vehicle sideways without turning the vehicle. Here, comes the application of three Mode Interchangeable four Wheel Steering, which provides the same by steering the rear wheels too as our requirement.

With the help of this system, the rear wheels also can be turned with respect to the direction of front wheels whenever required. Thus, the vehicle can be controlled more effectively especially during cornering, parking. When both the front and rear wheels steer toward the same direction, they are said to be in-phase. When the front and rear wheels are steered in opposite direction, this is called anti-phase, counter-phase or opposite phase. Our project concentrates on the advancement in steering system of an automobile with the objective to reduce the turning radius considerably up to 45 - 55 %, thereby reducing the space required to turn, and provide a sideways movement for easier parking and to reduce driver’s effort and handling.

A. Identification of Problem
In conventional four wheelers system has only one steering arrangement only to turn the front. To turn the car in short radius and in off road conditions we have to take the car in reverse. This is due to un availability of steering control of rear wheels following problem may occur.

B. Car Parking
With increasing number of vehicles on road its become more difficult for drivers to park the vehicles. With limited space available the time taken to park the vehicles is limited. With normal steering mode its highly unlikely to achieve the task. Hence there’s a need for some new mode for steering.

C. High Speed Lane Change
In race courts, it’s highly unlikely for cars to turn the car across the lane with front wheel steering in high speed. The wheels would tend to lock resulting in skidding of car probably leading to accident. Hence both rear and front wheels should be steered to control the car.
Whenever it comes to short radius, cars with front wheel steering generally stumble. It’s because front wheels generally will be steered properly across the short turning radius. But the rear wheel which follows it will not be steered properly. Hence special engagements are required to steer both rear and front wheels.

**II. PROPOSED METHODOLOGY**

Before Parallel parking and high speed lane change are achieved by steering both the wheels in same direction. Vehicle to be turned in short turning radius by steering both the wheels in opposite direction.

**III. EXPERIMENTAL DESIGN AND TEST RESULT**

<table>
<thead>
<tr>
<th>Turning Circle Radius</th>
<th>Four Wheel Steer</th>
<th>Two Wheel Steer</th>
</tr>
</thead>
<tbody>
<tr>
<td>By calculation</td>
<td>2.59 m</td>
<td>4.4 m</td>
</tr>
<tr>
<td>By experiment</td>
<td>2.85 m</td>
<td>5.75 m</td>
</tr>
</tbody>
</table>

**B. RESULT AND DISCUSSION**

The various type of steering control mechanisms are used for four wheeler vehicles. This is also one of the steering mechanism and which is utilized for three mode operation based on the condition required. The operation and mechanism of this unit and its function have been studied. At the end, the mechanism is assembled. This mechanism is more advantages of other types of steering mechanism since it has more easier to operate and also
less time consumption, easy handling etc. The project carried out by us made an impressing task in the field of automobile industries. It is very usefully for driver while driving the vehicle. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also been provided.

IV. WORKING PRINCIPLE

Our project consists of a steering setup, spur gears, bevel gears and lock nut. When the lock nut is removed, the steering operation is carried out in normal condition. That is only front wheels steer. But when the lock nut is inserted, the other two modes can be used.

When the gear arrangement is pushed to one position, the bevel gears get engaged and the steering of rear wheel is ensured and is in same direction as that of the front wheels.

When the gear arrangement is moved to other side, the bevel gear disengages and the spur gear gets engaged. Due to spur gear arrangement, the rear wheel steers in opposite direction to the front wheel. This results in third mode steering. Fig shows the third mode operation.

A. Normal Mode
B. Reduced Turning Radius Mode
C. Sliding Mode

A. Normal Mode

While tackling a turn, the condition of perfect rolling motion will be satisfied if all the four wheel axes when projected at one point called the instantaneous center. When the lock nut is removed, the steering operation is carried out in normal condition. That is only front wheels steer.

B. Reduced Turning Radius Mode

In 3rd mode of operation when another lock nut is inserted. The gear arrangement is moved to other side, the bevel gear disengages and the spur gear gets engaged. Due to spur gear arrangement, the rear wheel steers in opposite direction to the front wheel. This results in third mode steering. Fig shows the third mode operation.

C. Sliding Mode

In 2nd mode operation when the lock nut is inserted, the other two modes can be used. When the gear arrangement is pushed to one position, the bevel gears get engaged and the steering of rear wheel is ensured and is in same direction as that of the front wheels. Fig shows the second mode operation.

V. CONCLUSION

We make this project entirely different from other projects. Since concepts involved in our project is entirely different that a single unit is used to various purposes, which is not developed by any of other team members.

The project carried out by us made an impressing task in the field of automobile industries. It is very usefully for driver while driving the vehicle. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also been provided.

By doing this project we gained the knowledge of various mechanism, drives, fabrication with welding and how it can be effectively used to control the steering for light motor vehicle.
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