

# Reduced Turning Radius of Car Park and Lifting Mechanism

Mr. Badhe Bharat Gorakshanath<sup>1</sup> Mr. Patade Nilesh Prakash<sup>2</sup> Mr. Bande Smitesh Rajesh<sup>3</sup> Miss. Shirsath Snehal Ashok<sup>4</sup> Prof. Tathe Pradip G<sup>5</sup>

<sup>1,2,3,4</sup>Student <sup>5</sup>Professor  
<sup>1,2,3,4,5</sup>Department of Mechanical Engineering  
<sup>1,2,3,4,5</sup>SCSCOE, Rahuri, India

**Abstract**— This project aims for producing the system to reduce the turning radius of a car. The newly developed system consists of screw jack, gear mechanism with arrangement of the different kinematics links. The new developed system was driven by electric motor. In this at first car is lifted and then turned in the specified direction. The system will be sufficiently able in turning the car in any required direction without steering and has turning radius equal to the half of the length of car itself. The vehicle can be turned back in 40 second. This system can be useful in back turning on narrow road, traffic jam, changing of punctured wheels, better parking, etc.

**Key words:** Turning Radius, Lifting Mechanism, Parking, Traffic Etc

## I. INTRODUCTION

In India automobile giants like Tata, Hyundai, Maruti, Honda, Mahindra and Mahindra etc. are produced more than 3.2 million vehicles per year. The companies are focus more about the ergonomics fuel economy, space available, aesthetic features, and many other features. This vehicle includes broadly power window, power brake system, centre lock, tubeless tires, power steering, etc. for the development of new cars, the minor or major advantages were made in every car's feature. The designers should be focus to produce a vehicle, which will function at all condition and all time and also easy to operate and easy to drive.

Now-a-days people are preferring the bigger cars which are powerful having better ergonomic and aesthetic features and also simple to drive like Ford Icon, Tata Indigo, Mercedes Benz, Volkswagen, Nissan etc. Till upto all vehicles were driven by turning the front wheels in the required direction and the followed by rear wheels. We know that the front axle is the dead axle. But it is only true for heavy vehicles. Generally in four wheeller and the cars the front axle is a live axle. The roads are overflowed by vehicle due to the increasing demand of vehicle. Therefore several problem arising of parking at public places, at home and multiplexes, also at traffic etc.

## II. LITERATURE SURVEY

In zero turning it was shows that the vehicle rotating about an axis which is passing through the centre of gravity of vehicle instead describing a circular path as in conventional turning, i.e. the vehicle turning at the same place. it dose not required more space to turn the system because the car can be turn the length which is equal to the length of car itself. this is found in heavy earth mover like excavator.

In this work, concentrate on reducing the radius of vehicle while turning. Cho (2009) developed analytical model according to road wheel steering angle when vehicle steering return ability with maximum steering wheel angle at low speeds for the suspension geometry changes. The

turning radius of vehicle is the radius of arc shown by the middle of curved track made by the outside front wheel of the vehicle while making its shortest turn..

The zero turning radiuses found in heavy earth mover which consists of two parts, i.e. lower part, crawler chain. the upper part consist cabin and boom and the upper part of heavy earthmover can rotate about its center, so that direction of the boom along with cabin can be changed without changing direction of lower part. This type of vehicle require space which is equal to its length for turning, therefore turning radius of heavy earthmover like the excavator, JCB is zero. But, this type of vehicle has some disadvantages, like no tyres. Another car of zero turning radius the Jeep Hurricane, which has number of steering modes with the help of four-wheel independent steering. Every wheel can rotate independently from the others. The vehicle has two modes of four wheel steering.

The rear tires move in opposite direction of the front tires, which minimise the turning radius. There was change in second mode in which all the wheel turn in same direction that helps to the vehicle to turn sideways without changing the direction where it is in positioning while facilitating car vehicle on narrow road space. But in the next third mode each wheel of vehicle can be turn in every direction independently, so that they alternate. We know that Jeep Hurricane can actually move in place. But this type of car vehicle have some limitation like it has complex steering system to operate this system skilled operator is required. it also required two propeller and two engines shaft and hence it more expensive and wear of tires is also more.

From our literature and market survey describes that now a days there is no car available which has lifting and turning system. our work describe the development of system for minimising the radius of turning of car vehicle. Also describe the methodology for working of the system.

## III. DESCRIPTION

### A. Lifting and Turning Mechanism

As we have to produce the system of car vehicle, a structure or model of small electric car is used. Few modification are done to the current existing car vehicle by incorporating the electrical motor, spur gear, capacitor and screw jack. To the rotary motion into translatory motion, the power screw are used. The hydrolic system and mechanical system are the two methods were used for lifting and turning of car. In this model mechanical system was developed the increasing mechanism of car, screw jack is used. At end of the screw jack, a screw jack gear- 1 act as the nut jack and it is free to rotate over the body of screw jack. Gear 1 was engaged and fitted with second gear 2 and it was placed on the the shaft of reversible motor 2. Second end of screw jack was placed with body of car by foot step bearing.

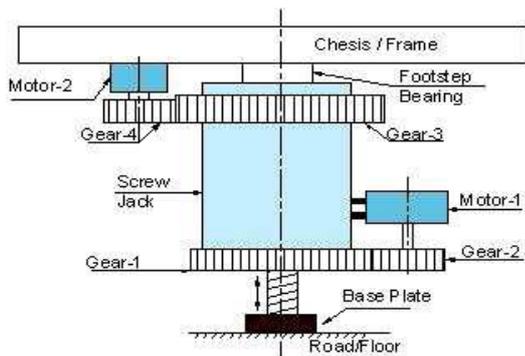


Fig. 1: Working diagram

Gear 3 was fitted on the body of screw jack at another end which helps for the turning mechanism i.e gear 3 is opposite to the gear 1. Gear 4 is mounted on the shaft of the reversible motor 2 this motor synchronised with gear 3. Motor 2 is fitted to the car frame. There are two motor used to drive the mechanism.

#### B. Balancing Mechanism

Balancing of the car is essential part during the lifting and turning of the car vehicle. Two methods are used for the balancing of the car. In that base plate is made bigger than the balancing, in first method. Whereas in the second method balancing wheel are used. This wheel are attached to the lever which is driven by power of the car.

### IV. DESIGN

Design consists of application of scientific principles and imagination for improvement of new improvised machine or mechanism to perform a specific task, technical approaches which having maximum economy & efficiency.

Therefore system should be design carefully. Whatever design work that totally split up into two parts.

- System design
- Mechanical Design.

#### A. System Design

The following parameters mainly concentrated in the system design:

##### 1) Selection of system on the basis of physical criteria

While selecting any machine firstly it is must to check whether that machine going to be used for large scale production industry or small scale production industry. In our work selected machine going to be used for the small scale industry. It can be adjusted anywhere basically to the corner of the room because system is vary small.

In any mechanical design it is directly depends upon the system design. Therefore for the most of job physical parameter is control, that's why the variation obtained after mechanical design can be well fitted into that.

##### 2) Arrangement of Various Parts

The space restriction of the component should be keeping in mind for the easy removal or servicing of components is possible. Also each component should be easily seen. No one should be hidden. Whatever the possible is utilizing for the arrangement of the components.

##### 3) System Components

It is already said that system should be compact so that it can be easily accommodate at the room corner. Moving parts of the system should be well fitted and compact. A compact design gives the desired high weighted system.

#### 4) Man Machine Interaction

The required criteria of design is the friendliness of machine to the operator which is operating. To solve the problem which created from the man machine interaction is the application of anatomical and physiological principle.

#### 5) Modes of Failure

In case of failure the losses generating by owner it is an important criteria while design the system. For the minimising the chances of failure factor of safety is kept should be larger. So that it maintains the less chance of failure. Also maintenance is required to avoid the failure of system.

#### 6) Facility of Servicing

The components should be accommodated in such way that it is easy to servicing. Specially the components which required servicing time by time can be easily removal and disassembled.

#### 7) Future Scope of Improvement

Component should be arranged in such a way that it increase the scope of work for the further edition. So that the system can be easily configured to convert the machine motor operated. For any case if it is required different shape of notches various type of punches and die are used.

#### 8) Machine Height from Ground Surface

The height of machine is firstly decided so that the operator which is operating the machine dose not get tired during the operation. The machine should be placed somewhat greater than waist level. Also for the cleaning purpose enough clearance must be provided from the ground surface.

#### 9) Machine Weight

Machine weight totally depends on not only material which is selected but also the dimension of the component. If the weight of machine is higher then it is difficult to transportation. It may be breakdown. Highly weighted machine not easy to take it to workshop.

#### B. Mechanical Design

For the successful project design depend on the correct design analysis of problem. It is an important criteria while designing.

Preliminary alternatives may be eliminated during the design. The person who going to be design have adequate knowledge of the material physical properties, deformation, loads stresses and failure theories. Designer should be able to find out not only the external forces but also internal forces which is acting on the system. Forces acts on the system can be classified as follows;

- Centrifugal forces
- Inertia forces
- Friction forces.
- Dead weight forces.
- Forces during power transmission etc.

Forces should accurately analysed by designer with the help of design equation. In case if the designer dose not have required knowledge to estimate the forces then he also make certain practical assumption on the basis of similar condition.

While designing the components are classified into two categories

- Part of design
- Parts which is to be purchased

In the design part, firstly design is created and then it is compared with the next greater dimension available in the market. This process simplifies not only assembly but also part production service work. On the basis of work specified the process chart is obtained.

The various part which is in going to be purchased directly obtain from the catalogue. It simplifies to purchase the material from the retail with the required specification.

#### V. ADVANTAGES

There are four main advantages which arise from the design of the mechanism. These are:

- The drive is compact and takes minimal space,
- The lifting mechanism is retractable hence it offers the same ground clearance as regular vehicle.
- The mechanism helps to parking in difficult conditions.
- Mechanism helps to jack car with power from car battery to change flat tyres.
- Mechanism helps to jack car on slopes safely as there is no danger of roll on.
- Tilting headlights help to get better visibility on right angle blind turns making driving safer in dark conditions.

#### VI. FUTURE SCOPE

- Light electric vehicles (LEVs)
- Automobiles (Cars/ Trucks/Buses)
- All-terrain vehicles (ATVs)
- Earth moving equipment
- Agricultural equipments

#### ACKNOWLEDGMENT

Every orientation work has imprint of many people and this work is no different. This work gives us an opportunity to express deep gratitude for the same.

While preparing project report we received endless help from number of people. This report would be incomplete if we don't convey my sincere thanks to all those who were involved.

Finally, we wish to thank my friends and family for being supportive us, without whom this seminar would not have seen the light of day.

#### REFERENCES

- [1] International Journal Of Engineering & Innovative Technology [IJEIT], "Developing A System For Reducing Turning Radius Of Car". By, B.L. Salvi, J.K. Maherchandani, Dr. B.P. Nandwana. Volume 1, Issue 3 March 2012.
- [2] "Journal Of Emerging Trends In Engineering & Applied Science [JETEAS] ISSN: 2141-7016 "Modification Of Existing Design Of A Car Jack". By, A.S. Akinwonmi, A. Mohammed.
- [3] Tata McGraw-Hill Education, "MACHINE DESIGN" By, V.B. Bhandari. 2010
- [4] "Mechanisms - Linkages- and Mechanical Drives - I A Chironis
- [5] Gupta, R. B., (2007). Automobile Engineering, SatyaPrakashan, New Delhi, pp 3-8 and 571-579.

- [6] Singh, K., (2008). Automobile Engineering Vol. 1, Standard Publishers Distributors, New Delhi, pp 448-453, 463-471.