

# Design and Fabrication of Foot Operated Steering System

Mr. N. Dinesh <sup>1</sup>, Mr. Vigneshwaran. S <sup>2</sup>, Mr. Sivasakthi. P <sup>3</sup>, Mr. Vignesh. R <sup>4</sup>,

1-Assistant Professor,

2, 3 & 4 - students

Department of Mechanical Engineering,  
Hindusthan Institute of Technology, Othakkalmandapam,  
Coimbatore – 641 008, Tamilnadu, India.

## ABSTRACT

Transportation has become an integral part of people's everyday life. At certain times, in large countries like India, people are forced to travel more than 200 km from their work place to their place of residence. People with disabilities in lower extremities and hands have difficulties in travelling and cannot travel these long distances. They use devices such as wheel chair, crutches and artificial limbs for mobility. These however cannot be used for long distance outdoor transportation. Therefore, the aim of this study is to design and fabricate 'Foot controlled steering system' for armless people.

The system will be using "Rack And Pinion" arrangement, which converts rotary motion into linear motion. The system consists of wheels, internal threaded cylinder, lead screw, linkages, rotating pinion and rack.

This system is compact and thus will be used for long distance transportation. The main objective of the project objective of the project is to design a foot controlled steering system for handicapped people and will be useful in military purpose. This system will be cost effective and easy to operate.

## INTRODUCTION:

Now a days transportation has become great difficulty to and individual to reach the destination on time. Everyone has their own vehicle and people with all body parts are fortunate. But it is unfortunate for partially disable people with hands. Disability is the repercussion of an impairment which can be mental, physical, emotional, vision, sensory. Disabilities can occur in upper extremities as well as in lower extremities. These people become more dependents and lose their confidence.

Due to this effect, they stand a great disadvantage in using public as well as private transportation facilities.

**Table 1: Disabled population by sex and residence**

Residence	MALES	FEMALES	PERSONS
Urban	45,78,034	36,00,602	81,78,636
Rural	1,04,08,168	82,23,753	1,86,31,921
Total	1,49,86,202	1,18,24,355	2,68,10,557

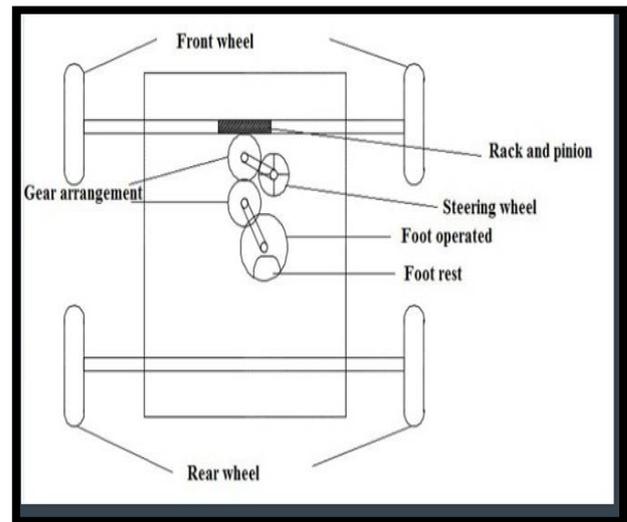
A national level survey conducted in India by the Central Government of India once in ten years revealed that, around 27 million people which are about 2.21% of the Indians are differently able. Among them, around 14.98 million were men while 11.84 million were women. Thus, the percentage of disabled people in rural area was higher than those in urban areas. A total of 5.43 million people were identified with disabilities in movement which was the highest among other categories.

**NEED OF FOOT OPERATED:**

- ✓ There are handicapped people who have weak upper portion of body.
- ✓ Innovative mechanism to convert the existing automatic transmission vehicle.

**OBJECTIVES:**

- ✓ To design and manufacture vehicle which can be operated by disable people.



**Fig.1 Foot operated steering system**

- ✓ To manufacture a car for long distance transport.
- ✓ To reduce the dependency on others to perform daily duties.
- ✓ To develop a system at affordable cost.
- ✓ Smooth driver can turn the vehicle in a minimum in a turning distance.
- ✓ The foot operated steering mechanism is a mechanism controlled by the foot.
- ✓ The main objective of the project is to design a FOOT OPERATED for a handicapped people.
- ✓ It will be useful in Military purpose.

- ✓ The system will be cost effective and easy to operate.

**Specifications:**

The materials used for manufacturing of different components are as follows:

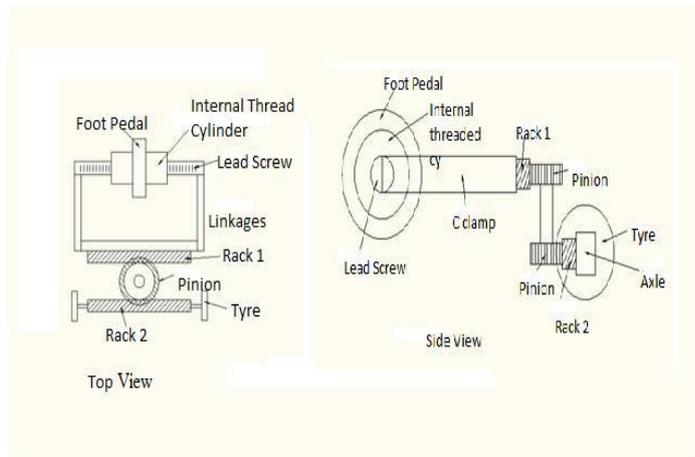
**Table :2 Materials used for different components**

SR NO.	Description	Material
1	Bearing	Carbon Steel
2	Bearing Holder	Steel
3	Axle	Carbon Steel
4	Shaft	Carbon Steel
5	Frame	Mild Steel
6	Wheel	Rubber
7	Rack And Pinion	Carbon Steel Case Hardened

**Side View and Top View of Model:**

The designing is done in ‘Autocad’. Fig 1 and fig 2 shows side view and top view of the model.

The figures show two dimensional view of model. It shows all components of system from different views.



**Fig.2 side view and Top view model**

**STEERING MECHANISM:**

The mechanism in a vehicle, vessel, or air craft which makes it possible to steer it in different directions.

**VARIOUS TYPES OF STEERING MECHANISM:**

There are three types of steering method, they are

- ✓ Power steering.
- ✓ Electric power steering.
- ✓ Speed sensitive steering.

**MATERIALS REQUIRED:**



**Fig.3 Bevel gear**

A gear working another gear at an angle to it by means of bevel gear.

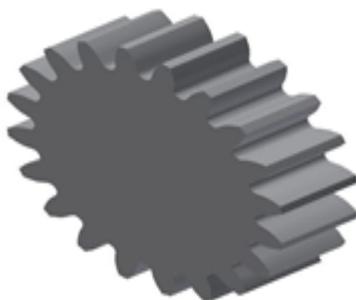
Bevel gears are used as the main mechanism for a hand drill .As the handle of the drill is turned in a vertical direction, the bevel gears change the rotation of the chuck to a horizontal rotation.

A number of teeth in bevel gear is 20 .which explains the nomenclature of the bevel gear.

Its normal gear ratio range is 3.2 to 10.1.

**RACK AND PINION:**

- ✓ The pinion moves the rack converting circular motion into linear motion along a different axis.
- ✓ Rack and pinion gives a good feedback there by imparts a feel to the driving.
- ✓ Most commonly used system in automobiles now.



**Fig.4 Rack and Pinion**

**BEARING:**

A Bearing in which the parts are separated by a ring of small freely rotating metal balls which reduce friction.

A metal ball used in ball bearing.

**BALL BEARING**



**Fig.5 Ball Bearing**

Rolling contact bearings are comprised of ball bearings and roller bearings. Ball bearings, as the name suggests, utilize balls or spherical shaped rolling elements that are contained between an inner and outer ring. Most roller bearings use either cylindrical or tapered rolling elements. Both are used primarily to support rotating shafts in

mechanical equipment. They can be found in everything from personal computers to passenger cars. They are of simple design and can be precision made in mass production quantities. They can support heavy loads over a wide speed range

## METHODOLOGY

The system consists of an internally threaded pinion and one externally threaded lead screw which are engaged like nut and bolt arrangement. C-clamp is used to transfer the motion of lead screw.

A rack is connected to C-clamp. The rack is engaged to first pinion. This pinion is centrally aligned with second pinion. One more rack is connected to this pinion to convert rotary motion into linear motion. The wheels are at both ends of the rack.

Initially the pinion is rotated in clockwise direction by using left foot. Due to this motion, the lead screw moves to the left side.

C-clamp transfers the motion to rack. Rack moves along with C-clamp. The first pinion which is engaged with rack will start rotating in clockwise direction due to motion of rack. The second pinion also rotates in same direction as the first. The second pinion again transfers motion to another rack which has wheels at its both the ends and rack will move in right direction.

Due to the motion of rack, the wheels will move to right direction and vehicle will take right turn. Similarly, when driver rotates pinion in anti-clockwise direction the exact opposite mechanism will occur and vehicle will take left turn. This system can be mounted in cars having automatic gear system because the clutch of the vehicle is to be replaced by lead screw and pinion pair.

## ADVANTAGES:

- ✓ This is very innovative idea for handicapped person with inactive upper limbs.
- ✓ Operation and handling is easy and can be learned with little practice
- ✓ Efficient travel also means fuel savings ,cutting costs
- ✓ It is very easy to handle for handicapped persons.

## DISADVANTAGES:

- ✓ This can be implemented in automatic transmission (Gearless) vehicles only.
- ✓ Initial practice is required to become habitual of new steering system.

**CONCLUSION:**

In this venture we have considered and executed a foot worked controlling framework for physically tested armless individuals. This gadget is effectively intended to give a more noteworthy preferred standpoint to physically tested individuals.

We can achieve that most extreme speed of the auto is 40 km/hour. As the framework is cumbersome the efficiency diminishes, however this influence is immaterial. The framework is just pertinent to naturally determined autos and accordingly reasonable for long separation transport.

**REFERENCES:**

- [1] Arun Raju C, Anish Raman C, Veerappan K.R.Venkat Narayanan; "Dual steered three wheeler for differently able people", European Scientific Journal May 2014 edition vol.10, no.15 Issn: 1857 – 7881 (print) e  
- Issn 1857- 7431.
- [2] Arun Manohar Gurrana, P.S.V Ramana Rao, Raghuvveer Dontikurtia; "Solar powered wheel chair: Mobility for physically challenged", International journal on current engineering and technology, vol.2, no.1 (March 2012).
- [3] Major General Vijay P Pawar and Dr George Judah, A Study on the Rehabilitation Facilities Provided by the Government to People with Disabilities & Its Awareness in the Society, International Journal of Management, Volume 5, Issue 8, 2014, pp. 16 - 24.