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Design and Fabrication of Foot Operated Vehicle for Armless People

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ABSTRACT: Transportation has become an integral part of peoples' day to day life. At certain times, in large countries like India, people are forced to travel long distance from their work place to their place of residence. People with upper limb amputation 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 project is to design and fabricate. Foot operated system for armless people. The Foot Operated Steering mechanism is a mechanism controlled by foot or both the feet in order to steer the vehicle in the desired direction. This system consists of a steering which can control brake along with steering. The main objective of the project is to design a foot operated system for handicapped people.

KEYWORDS: electric vehicle, foot operated steering system, weight distribution, accessibility using foot

I. INTRODUCTION

Now-a-days transportation has become great difficulty to an 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: Population of people with disabilities by type of disability

Types of Disability	Males	Females	Persons
Mental retardation	8,70,708	6,34,916	15,05,624
In hearing	4,15,732	3,07,094	7,22,826
In seeing	26,77,544	23,93,463	50,71,007
In speech	26,38,516	23,93,947	50,32,463
In movement	11,22,896	8,75,639	19,98,535
Any other	33,70,374	20,66,230	54,36,604
Multiple disability	27,27,828	21,99,183	49,27,011
Multiple disability	11,62,604	9,53,883	21,16,487
Total	1,49,86,202	1,18,24,355	2,68,10,557

Foot Operated Steering was something new to come up with and we had an interest to make something innovative. 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. The main objective of the project is to design a foot operated system for handicapped people and will be useful in military purpose. This system will be cost effective and easy to operate.

II. LITERATURE REVIEW

Pranchal Srivastava, Raj Kumar Pal “A Low Cost Mobility Solution for Physically Challenged People”., International Journal of Mechanical Engineering and Technology (IJMET) Volume 6, Issue 12, Dec 2015: The most common approach used in most powered wheelchairs is having two motors for traction each driving a wheel on either side of the machine. the motion is achieved by keeping the speeds of the motors identical in one direction and the other direction for reverse motion. Turns are executed by making the speeds of the motors different. The radius of turn depends on the speed difference.

Challenged People Using Arm Processor”. International Journal of Mechanical Engineering and Technology (IJMET), Volume 6, Issue 12, Dec 2015: The aim of the technology is to help those handicapped who don't have healthy hands to run a vehicle by giving the voice commands. In this the driver need not use the steering instead his head. This vehicle is only for those handicapped those who can nod head well. Four switches are interfaced over the neck of the driver, and the vehicle can be controlled by the head movement. Corresponding tactile switches are activated according to the movement of the head, and towards the conclusion the practical difficulties are described and the possible solutions are discussed.

Jose M.del Castillo (2001) in their research obtained the analytical expression for the efficiency of any planetary gear train using Cramer's rule. They find the gear tooth ratio employing a speed and torque equations and gearing power and speed ratio

D. Mundo (2006) Designed a planetary gear trains to generate a variable angular velocity ratio using non-circular gears by using CAD software, PTC-pro engineer. He reduced the typical torque fluctuations of a low speed way of pedaling in order to maximize the output.

Rince Wins, DhaneshChatta and Anish Nair et al., “Design of Pneumatic Collapsible Steering” in this paper, he studied that, as we know, the fact is very correct that accidents are increasing day by day. On considering the injury potential of steering wheel this project gives a new and more safer design for the steering wheel.

Utkarsh. M. Desai and Dhaval A. Patel et al., “Static and Dynamic Analysis of Composite Material for Spur Gear”, in this paper he studied that, The weight of GF 30 PEEK Composite Material is reduced as compared to the existing Material (Alloy steel) which in turn results in improved power transmission which overall improves the efficiency of the system. Besides, from the cost aspects, initially, composite material GF30 PEEK is costly than alloy steel material.

DipalkumarKoladia et al. studied that Mathematical Model to Design Rack And Pinion Ackerman Steering Geometry”, in journal he studied By applying and solving three equations of mathematical model for any vehicle, rack and pinion Ackerman steering geometry for any vehicle can be designed. Steering geometry can be optimized by using mathematical model for Ackerman condition for different inner wheel angles and select geometry for which percentage Ackermann as well steering effort is optimum.

III. METHODOLOGY

3.1 Problem Statement

For the disable-bodies, the task of selecting the right bike or any transport vehicle can be a difficult prospect. So you may think that choosing a bike for a disable person would be much more difficult. However, for those also with special driving needs. This product is designed to assist people with disabilities to independently drive a vehicle. This project supports the rider's disability by helping them balance the vehicle, be effortless to operate and also looking and functioning like a main stream bicycle. This helps the rider gain the independence and confidence to ride a vehicle without assistance. Although this vehicle has been designed specifically for people with disabilities. They are not allowed to move all around by themselves because of the reason of the inability. Many vehicles have been made on the disabilities for the people with no legs, but there is no vehicle particularly made for the armless people.

3.2 Objectives

- To design and manufacture a vehicle which can be operated by disable people.
- To make a steering arrangement system for handicapped people with no arms.
- To develop a system at affordable cost.

3.3 Methodology

Methodology deals with the process followed to perform the study. In context of this project, following steps are followed,

- Problem Identification
- Objectives
- Design of System
- Validation of System
- Implementation
- Performance Analysis.

IV. WORKING

Disability is the repercussion of an impairment that can be mental, physical, emotional, vision, sensory or an amalgam of these. Disabilities have become a roadblock for disabled people to live a normal life. However, many of these impairments especially physical can affect the function of limbs. These can occur by birth or as a result of accident or an aftermath of a disease. This can affect the maneuverability of the people greatly. Due to this effect, they stand a great disadvantage in using public as well as private transportation facilities. Due to their disabilities, their level of being employable reduces and it affects them in becoming financially independent. To overcome from this disability, we had design this model. In this project we had replaced steering wheel by pulley. Pulley is placed on lead screw .lead screw and first rack are fixed M.S. square pipe. First Rack is engaged to 1st pinion. The working of rack and pinion is to transmit linear motion into rotating motion. At time of taking turn, driver rotates the pulley by foot in clockwise/anti clock wise direction, as per requirement. Pulley rotates the lead screw. Due to rotation lead screw move on left or right respective to direction of pulley rotation. Racks rotate the first pinion, pinions rotate the shaft and shafts rotate the 2nd pinion. Two pinions are on same shaft therefore rpm of these pinion will be same. 2nd pinion is engaged to the 2nd rack.

V. EXPERIMENTAL SETUP

Design of Model:

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.

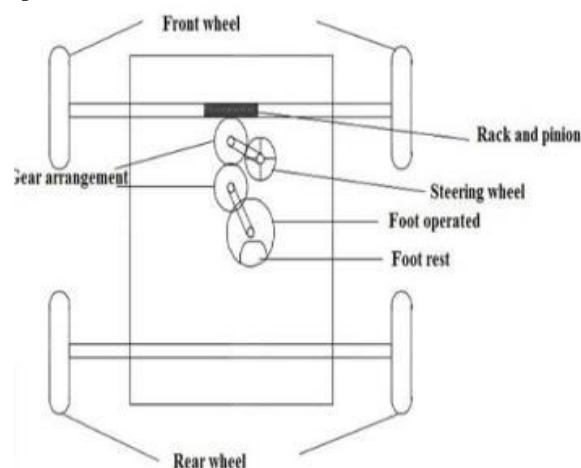


Fig. 1: System Design

Steering Mechanism:

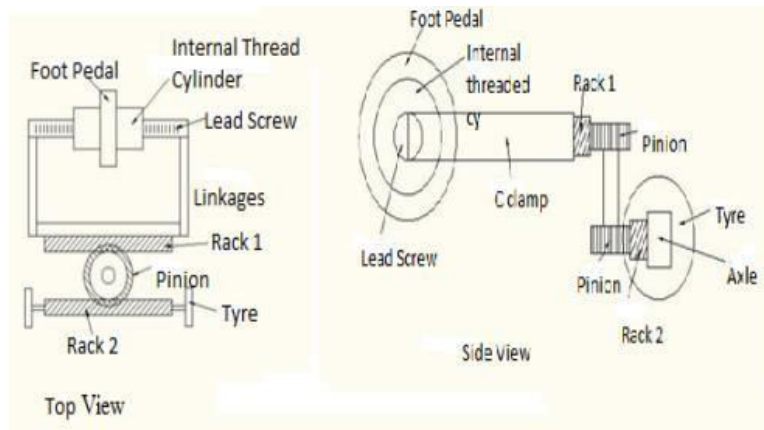


Fig. 2: Steering System

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 anticlockwise 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.

The steering mechanism consists of a steering rod which is nothing but the vehicle handle and an operative rod which is mounted in two bearings attached to an 'L' shaped connecting rod. Also it consists of two sprockets and a chain to transmit the motion from the operative rod to the steering rod. The two sprockets are attached at the upper ends of these rods in such a way that, the rotation of one will lead to the rotation of other. A pedal mechanism is provided at the bottom of the operative. The operative rod which mounted in two bearings is connected with the steering rod with the help of an 'L' shaped connecting rod which is welded at its two ends respectively.

VI. CONCLUSION

The main objective of this project is to develop the foot operated electric vehicle for armless people. The fabrication of this kind of vehicle includes material selection for the chassis and the chassis was fabricated by bending the channels/box sections and welded to achieve the proposed design. The back axle, wheels and bearings are also selected based on design procedures. After fixing the front fork; a perforated sheet was fixed to cover entire body of the vehicle and also the seats. Finally wheels and hub motor were mounted and the electrical connection is given with a battery.

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] Manish M. Patil (2017), Design & Development for Three Wheeler Chassis, International Conference on Emanations in Modern Technology & Engineering.
- [2] Mr. Praveen D. Dethan, Syam M. Nair, Nandu Vijayakumar, Sarath Kumar (2017), Foot Controlled Steering System, International Journal of Mechanical & Industrial Technology.

- [3] M.A.Saedi, Stability of Three Wheeler Vehicle with & without control system.
- [4] KumbharVikas S, NaganeSwapnil S, PatilSuraj Y, PawarRohit B (2015), Handfree Vehicle for Disabled, IJSRD
- [5] MandarSonam, SumitSonekar, SaurabhUpadhye (2015), Foot Operated Steering For Disabled People, IJMET.
- [6] MandarPatil, PrashantPawar, SwapnilPatil, SwapnilHonroa (2016), Foot Operate Steering Machanism, IERJ.
- [7] Mr. Praveen D. Dethan, Syam M. Nair, NanduVijayakumar, Sarath Kumar (2017), Foot Controlled Steering System, Internation Journal of Machanical& Industrial Technology.
- [8] A Somaiah, K. ViswanathAllamraju, G.SaratRaju and BLN Krishna Sai, Study of Innovative Regenerative Brake For Automobiles, International Journal of Mechanical Engineering and Technology, 8(8), 2017, 20–25.
- [9] S. Dwivedi, D. Yadav, A. Mishra, M. Jaiswal, S. Singh, S. Kumar, Design and Fabrication of a Motorized Tricycle for Physically Challenged Persons, International Journal of Engineering Science Invention, 3, 2014, 29-32.
- [10] Lucas H.V. Vander Woude, Ingrid vriend. “Mechanical Advantage in Wheelchair Lever Propulsion” Journal of Rehabilitation Research and Development-1997.
- [11] Michael C. Godoy. “Ergonomics Analysis of Tricycle Sidecar Seats” Asia Pacific Journal of Multidisciplinary Research-2015.
- [12] ArunRaju C, Anish Raman C, VeerappanK.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.
- [13] Caroll Smith, Racing Chassis and Suspension Design, society of Automotive Engineers, Inc. 400 commonwealth drive, Warrandale, PA 15096- 0001, 2004.
- [14] Cristina ElenaPopa, Steering System and Suspension Design For 2005 Formula Surveying
- [15] Dr. Anil Kumar Mishra (Ph.D.) and Neeti Mishra. A Review on Childhood Disability and Its Direct and Indirect Cost to Families, International Journal of Mechanical Engineering and Technology, 5(11), 2014, pp. 96-102.
- [16] Ravi Jain, Luke lee. Fiber Reinforced Polymer (FRP) Composites for Infrastructure Applications. Focusing on Innovation, Technology Implementation and Sustainability. Springer 2012.
- [17] 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.
- [18] Bhandari, Design of Machine Elements, third edition, McGraw Hill Education, India, 2010 Man, H. L., et al. „An adaptive cruise control system for autonomous vehicles“, „International Journal of Precision Engineering & Manufacturing“,vol 14 issue 4 ,PP 373-380,2013.



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