

REDESIGN AND MODIFICATION OF TRICYCLE FOR PHYSICALLY HANDICAPPED PERSON

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ABSTRACT

The project involve slider crank mechanism as well as the permanent magnet DC motor. The slider crank mechanism is connected to the one of the rear wheel of tricycle and the permanent magnet DC motor is attached to the front wheel with the help of chain and sprocket mechanism. We are connecting slider crank mechanism only at one wheel of the tricycle (rear wheel), because it is helpful during turning it act as a differential. The permanent magnet DC motor is run with the help of battery source and the battery is charge by AC supply. This type of tricycle is very useful for handicapped person who is economically poor. And is environmental friendly because it doesn't contribute in pollution.

Keyword — slider crank mechanism, permanent magnet DC motor, handicapped person, battery, environmental friendly

I. INTRODUCTION

Transportation is one of the important factor in our day to day life, but for normal person it is very easy to go from one place to another place and this is very difficult for the handicapped person. In the world almost 100-130 million people need wheelchair. Handicapped person normally use tricycle which work on the chain and sprocket mechanism it operated by hand, but it has some disadvantages. Motorized tricycle is also developed, but now a days the price of fuel is increase rapidly and pollution is also increase rapidly. So that, this type of tricycle is very useful for handicapped as well as normal people. Current wheelchair technology is relatively well established, but price is also increase with new technology. So, in our tricycle we are using permanent magnet DC motor and the slider crank mechanism. The slider crank mechanism is attached to the one of the rear wheel of the tricycle and one wheel is free to rotate. And the permanent magnet DC motor is mounted on the front wheel of the tricycle.

Steering propulsion system required less effort to move forward than the chain and sprocket mechanism. This tricycle is move in forward and backward direction also. It can be stop without applying brake only by keep steering steady.

II. Objective

The main objective of this project is to form efficient vehicle with affordable price and by using less effort propel the vehicle.

III. Components:

- a. **Chassis:** A chassis consists of internal framework that supports a manmade object in its construction and use. It is analogous to an animal's Skeleton. An example of chassis is the under part of a motor vehicle, consisting of the frame (on which the body is mounted).
- b. **Motor:** In a DC motor, an armature rotates inside a magnetic field. Basic working principle of DC motor is based on the fact that whenever a current carrying conductor is placed inside a magnetic field, there will be mechanical force experienced by that conductor. All kinds of DC motors work in this principle only. Hence for constructing a DC motor it is essential to establish a magnetic field. The magnetic field is obviously established by means of magnet. The magnet can be any types i.e. it may be electromagnet or it can be permanent magnet. When permanent magnet is used to create magnetic field in a DC motor, the motor is referred as permanent magnet DC motor or PMDC motor.
- c. **Battery:** Lead Acid batteries are the most suitable in existing technology for electric vehicle because they can deliver high output because of having capability to store high power per unit of battery mass, allowing them to be lighter and smaller than rectangular batteries.
- d. **Pedestal bearing:**
 - Pedestal bearing is also known as Plummer block bearing
 - Pedestal bearing is used to support the rotating shaft with the help of compatible bearings.
 - The fundamental application of pedestal bearing is to mount a bearing safely enabling its outer ring to be stationary while allowing rotation of the inner ring.

Cad model of tricycle:

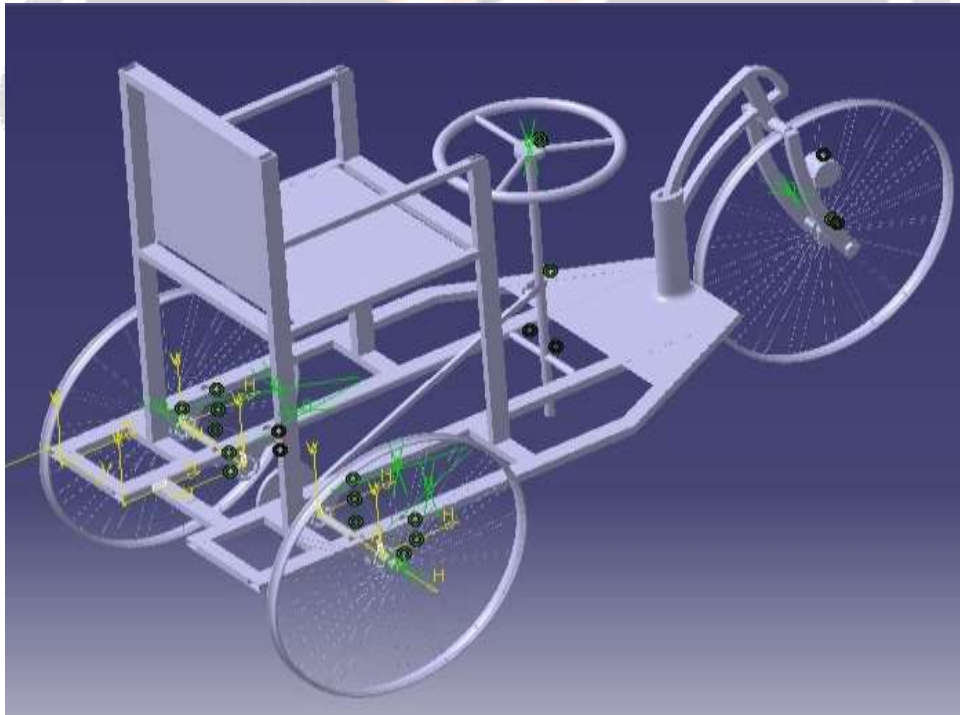


Fig: CAD model of tricycle

IV. Construction and working principle:

It consist of three wheel, two at the back side and one at the front side of the cycle. On one of the back wheel, slider crank mechanism is attached. The wheel axle is attached to the shaft and other side of shaft, crank is attached. Other wheel is also attached to the shaft, but the crank is not attached to it. And this is all attached to the chassis of the vehicle. On the chassis, seating arrangement, steering, brake, battery, motor etc. are mounted. The connecting rod of the slider crank mechanism whose one end is attached to the crank and other end is attached to the lower side of the steering rod and upper side of steering rod steering is connected. The PMDC motor is mounted on the front wheel fork, the power is transmitted to the front wheel from motor with the help of chain and sprocket arrangement. The motor is connected to the battery through the controller, which control all the functions of the motor like speed, on off of motor etc. the accelerator and the brake system is attached just below the steering to control the speed and to stop the motor.

When we apply the force on steering in forward and backward direction liver and crank provide the motion to wheel chair by converting the sliding motion into rotary motion. The motion of direction of wheelchair is controlled by steering. The device is operated by to and fro motion of steering which help to rotate the wheel, the turning action takes place by tilting the steering clockwise and anticlockwise direction.

It is the same working principle of DC motor when a current carrying conductor is comes inside a magnetic field a mechanical force experienced by the conductor and we define the direction of this force by Fleming's left hand rule. It is the same in permanent magnet; we place the armature inside the magnetic field of the permanent magnet and this armature rotates in the direction of generated force and the compilation of force produced by each conductor produces a torque which tends to rotate compilation of force produced by each conductor produces a torque which tends to rotate the armature.



Fig: fabricated view of tricycle

V. Design of shaft:

Design of Shaft:

Material for shaft:

SAE 1045 (Carbon steel) oil quenched and drawn 700 °C

Sut = 579 MPa and Syt = 306 MPa.... (From T.N. II-7 of data book)

For solid shaft,

$$\tau \leq 0.3 \text{ Syt or } \tau \leq 0.18 \text{ Sut}$$

$$\tau = 0.3 \times 306 = 91.8 \text{ MPa}$$

$$\text{Or } \tau = 0.18 \times 579 = 104.22 \text{ MPa}$$

Consider minimum value of 'τ'

$$\therefore \tau = 91.8 \text{ MPa (without keyway)}$$

According to torsional strength of shaft,

$$T \times Kl = \frac{\pi}{16} \times \tau \times D^3$$

$$128 \times [10]^3 \times 1 = \frac{\pi}{16} \times 91.8 \times D^3$$

$$\therefore D = 19.22 \text{ mm}$$

Standard diameter for shaft, D = 20 mm

VI. Components with specifications:

Sr. no.	Name of part	specification
1	Ring (back)	28inch
2	Tyre (back)	10ply
3	Ring (front)	26inch
4	Rectangular pipe	2/1 inch
5	Connecting rod	750mm
6	Steering pipe	11 inch

Sr. no.	Name of part	specification
7	Bearing clips	1.25/1.25 inch
8	Sheet (parporated)	(4×4) fit
9	Round pipe	0.75 inch
10	Flat	75×5 mm
11	Crank	200mm
12	Shaft	∅20mm
13	Pedestal bearing	No. 205
14	Nut and bolt	M8, M5, M6

VII. Result:

Slider crank mechanism required less effort to move, than chain and sprocket mechanism. The initial torque required to start the movement of tricycle is higher because the torque required by motor to cut the flux and generate power is high. But once the tricycle is in motion the torque is reduce and speed is increase.

VIII. Future scope:

- Alternator can be used to charge the battery.
- Gear system can be used to increase the speed of the tricycle.
- It can be foldable by using different types of linkages and nut and bolt also.
- Clutch can be used to engage or disengage the connecting rod.

IX. References:

- [1] V. B. Vaidya “Design & Fabrication Of Wheelchair Cum Tricycle For Physically Challenged & Elder People”, IJSRD vol. 4, Issue 04, 2016 ISSN 2321-0613.
- [2] P. R. Jawale, A.R. Gabhane, K.G.Baje, D.B.Lakade, D.N.Patil, department of electrical engineering, “A Review On Modern Hybrid Tricycle For Handicapped Person” International journal of research in Advent technology E-ISSN:2321-9637.
- [3] P. Jeyaraman, V. Praveen, N. Rajamurugu., “Fabrication Of Solar Electric Tricycle Foe Handicapped Person”, IJPRET, 2014, volume 3 (4):285-292. ISSN:2319-507X
- [4] Ajit tiwari, Rahul Mishra, abhishek sharma, amitesh sharma, Purushoem Mishra “Handicapped steering cycle” international journal of scienific and technology research volume 5, issue 05, May 2016, IssN 2277-8616.
- [5] Jayent Munot, Prajak Dipte, Rahul Chaudhari, Sumitsing Baghele, Amit Meshram “study And Fabrication of Manually Operated Handicapped Wheelchair” Presented at International Journal of Innovative Research in science and engineering VOLUME -2 ISSUE -04, April 2016.
- [6] B. D. Shiwalkar “Design Data For Machine Element”