

“Design And Deveploment Of Socio-Economic Three Wheeler Car For Disable People”

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Abstract : Most of handicapped people have a problem of moving from one place to another place a lot of difficulties and hassles involved with the mobility of the physically disabled people in the society. It has been observed that physically disabled people are basically using some assistive devices like crutches, artificial limbs or legs etc. and manual wheel chairs or three wheelers for their day-to-day movement.

But this is developed three wheeler can be used easily by handicapped person and normal person also. It is very light weight and this vehicle run can run on solar energy and if batteries are not charged they also can run by pedals. This consume very less space, so can be parked anywhere. Due to less number of mechanical parts maintenance cost is low

Index Terms- Electric Battery, Three-wheel vehicles, lithium-ion battery, chassis.

1. INTRODUCTION

The term Disability covers impairments, activity limitations, and participation restrictions. Impairment is a problem in body function or structure. An activity limitation is a difficulty encountered by an individual in executing a task or action. However participation restriction is a problem experienced by individual involvement in life situations. Disability is caused by impairments to various subsystems of the body – these can be broadly classified under the following categories.

Any impairment which limits physical function of limbs or damage of limbs or organs is a physical disability. Mobility impairment is a category of disability that includes people with varying types of physical disabilities. This type of disability includes upper limb disability, lower limb disability, manual dexterity and disability in co-ordination with different organs of the body. Disability in mobility can either be a congenital or acquired with age problem. This problem could also be the consequence of some disease.

Physical disability is also termed as handicap, when physically challenged people come across social cultural or physical barriers which prevent their access to different system in the day to day life which are available for other common people. Thus handicap is the loss of opportunities to take part at equal level with others. One of the areas where physically challenged people lose out is transportation. Transport disability keep out current physically challenged people from all form of transport like public, private and personal transportation. These in turn limit their ability to Interact with others in the society and take up jobs or business away from their home. Access to transport will give them freedom to live independent life.

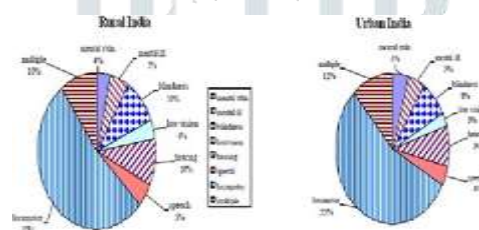


Fig:- Difficulty faced by the physically challenged person

Census 2001 has revealed that over 21million people, about 2.1% of the population, in India are suffering from one or the other kind of disability [1]. Among the total disabled in the country, 12.6 million are males and 9.3 million are females. Although the number of disabled is more in rural than urban areas, such proportions of the disabled males and females are 57-58% and 42-43% respectively. The disability rate (number of disabled per 100,000 populations) for the country as whole works out to 2130. This is 2,369 in the case of males and 1,874 in the case offemales.

Table:- Number of disabled population and the type of disability

	Population	Percentage (%)
Total population	1,028,610,328	100.0
Total disabled population	21,906,769	2.1
Disability rate (per lakh population)	2,130	--
Type of Disability		
(a) Vision	10,634,881	1.0
(b) Speech	1,640,868	0.2
(c) Hearing	1,261,722	0.1
(d) Movement	6,105,477	0.6
(e) Mental	2,263,821	0.2

**Fig. 2 Percentage distribution based on type of disability**

From the statistics it is evident that majority, 52% in Rural and 55% in urban area, of the physically challenged lack facility for transport. Among these are, 1217 males and 785 females per million people [2] these numbers are taken from NSS 58th rounds of survey.

For people with lower limb disability accessibility and movement from one place to another place is primary issues. Access to public areas such as city streets and public buildings and restrooms are some of the more places where physically challenged people face problem.

In recent years a noticeable changes have taken place in the society which can be seen in the form of installation of elevators, automatic doors, wide doors and corridors, transit lifts, wheelchair ramps, curb cuts, and the elimination of unnecessary steps where ramps and elevators are not available, allowing people in wheelchairs and with other mobility impairments to use public sidewalks and public transit more easily and more safely. From the above statistic lower limb disability is second higher and for them ease of transit is the demand and giving workable solution is the main requirement.

Configurations

Diagram showing an initial velocity for three vehicles and the corresponding angular displacement from the initial wheel positions required to change the direction of the initial velocity vector by the same value when turning using various three-wheeled vehicle steering mechanism configurations.

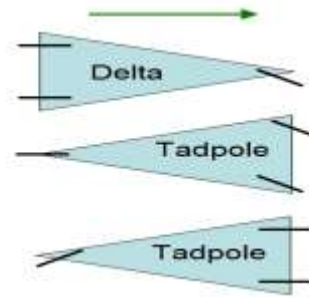
Two front

A configuration of two wheels in the front and one wheel at the back presents two advantages: it has improved aerodynamics, and that it readily enables the use of a small lightweight motorcycle power plant and rear wheel. This approach was used by the Messerschmitt KR200 and BMW Isleta. Alternatively, a more conventional front-engine, front wheel drive layout as is common in four-wheeled cars can be used, with subsequent advantages for Transversal stability (the centre of mass is further to the front) and traction (two driven wheels instead of one). Some vehicles have a front engine driving the single rear wheel, similar to the rear engine driving the rear wheel. The wheel must support acceleration loads as well as lateral forces when in a turn, and loss of traction can be a challenge.

A new tadpole configuration has been proposed with a rear engine driving the front wheels. This concept (Dragonfly Three Wheeler) claims both stability and traction (two driven wheels), as well as a unique driving experience.

With two wheels in the front (the "tadpole" form or "reverse trike") the vehicle is far more stable in braking turns, but remains more prone to overturning in normal turns compared to an equivalent four-wheeled vehicle, unless the centre of mass is lower and/or further forward. Motorcycle-derived designs suffer from most of the weight being towards the rear of the vehicle.

For lower wind resistance (which increases fuel efficiency), a teardrop shape is often used. A teardrop is wide and round at the front, tapering at the back. The three-wheel configuration allows the two front wheels to create the wide round surface of the vehicle. The single rear wheel allows the vehicle to taper at the back. Examples include the Apterl 2 Series and Myers Motors NmG.



Two rear

Having one wheel in front and two in the rear for power reduces the cost of the steering mechanism but greatly decreases lateral stability when cornering while braking.

When the single wheel is in the front (the "delta" form, as in a child's pedal tricycle), the vehicle is inherently unstable in a braking turn, as the combined tipping forces at the centre of mass from turning and braking can rapidly extend beyond the triangle formed by the contact patches of the wheels. This type, if not tipped, also has a greater tendency to spin out ("swap ends") when handled roughly.

Block Diagram

Product Discovery – Suitable material and design form is investigated. Top down approach is chosen.

Product Definition – Important dimensions were determined by survey and calculations.

Product Design - The chassis is to be designed.

Methodology

The research work, as previously said, foresee the definition of a planned methodology of virtual design of electric vehicle, able to be applied both in the design process of a new vehicle and in the tuning process of an existing one. We can see how to the process of mathematical modeling and numerical analysis of the mechanical systems proceeds in a parallel way respect to the physical process of experiment model and testing the interaction of these ones speeds up the entire process of testing and design, optimizing performance and reducing time.

We can easily understand how the process of numerical analysis of the dynamic performance and its target values are the fundamental guide for the entire design

process. So, the methodology previously described can be revisited and better defined to achieve a new process structure with new logical links among the different phases. The definition of the target dynamic performance of the vehicle, become the first and more important phase of the entire process.

The process of design is systematic in which knowledge of various existing chassis designs, materials used to manufacture are to be known. A handicap passenger three wheel electric vehicle chassis is designed which includes a hub motor of around 900 N-m torque

HARDWARE DESCRIPTION

➤ **Parts of three wheel electric vehicle**

1. Chassis
2. Motor
3. Handel
4. Tires
5. Brakes
6. Three Wheel System
7. Accessories

1. Chassis

The chassis is an extremely important element of the vehicle, as it must provide, via flex, the equivalent of suspension to give good grip at the front. The chassis of three wheel electric vehicle was designed on the parameters to guide complete safety of rider as well as to maintain the feasibility of three wheel electric vehicle for all loads applicable. The loads that are applicable on the chassis are studied under various consideration vehicle sprung, mass load, cornering forces, impact forces, torsional rigidity and the overall dynamic loads applied during running condition. The chassis support the power unit, power training system etc.

2. The Chassis construction

The chassis of three wheel electric vehicle consist of following components suitably mounted

- Electric Motor
- Road wheels.
- Handle
- Brakes.
- Battery

All the components listed above are mounted on the conventional construction, in which a separate frame is used and the frameless or unitary construction in which no separated frame employed

STEERING SYSTEM:

The steering of handicap three wheel electric vehicle is very sensitive. Because of lack of a differential, a three wheel natural direction of travel, forwards, is very difficult to change. However, the two rear wheels are attached by a solid axle, and must therefore move together, so in order to turn; one of the wheels needs to skid over the track surface.

In this vehicle we use a special kind of steering system, disc and link mechanism. This mechanism with modification is widely used in turning wheels or controls a front wheel especially formula one car.

In this system, the steering spindle is connected to a disk or plate and this disk is connected to the front two wheels using two links. When steering rotates, the disk also rotates and as a result, the link actuates and the wheel will turn according to the rotation of steering

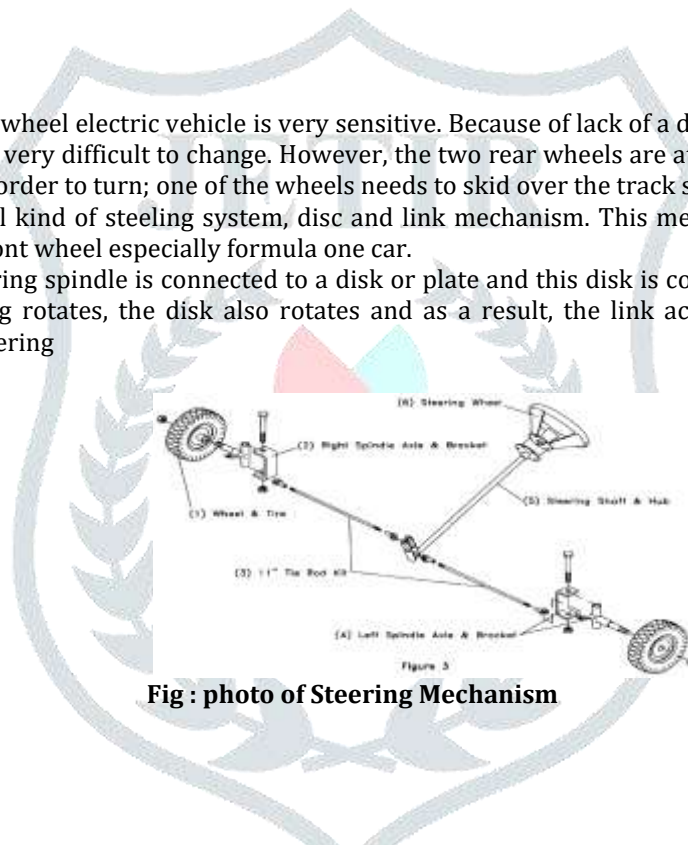


Fig : photo of Steering Mechanism

TRANSMISSION

Transmission means the whole of the mechanism that transmits the power from the engine crankshaft to the rear wheels. In this vehicle, the power from the electric vehicle is transmitted to the sprockets using chain, i.e. this is chain drive. Usually handicap three wheel electric vehicles do not have a differential and so we eliminate differential from our vehicle also. And also this vehicle has no clutch and gears because this is automatic transmission. Belt and pulley type CVT is used in this vehicle. The power from the motor is transmitted to the rear two wheels using chain drive. We use chain drive because it is capable of taking shock loads.

TYRES

For vehicle, wheels and tires are much smaller than those used on a normal car. The tires will have increased grip and a hard one. And also it can withstand the high temperature. In this kart, we use tires having 14" dia for front and 16" dia for rear. This is used for an aerodynamic shape.

The hidden side of the tire

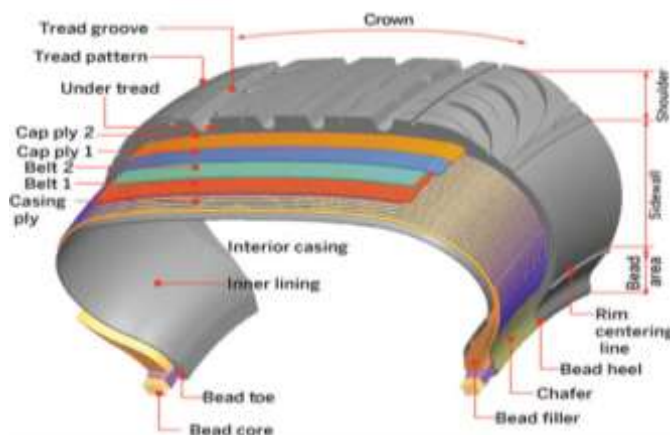


Fig. 11 : photo of hidden side of tire

BREAK

Typically, vehicle will have single rear disk brakes, which is situated on the rear axle. The brake will capable for stopping the vehicle running in 40 mph. The pedals actuated by the left leg operate the brakes.

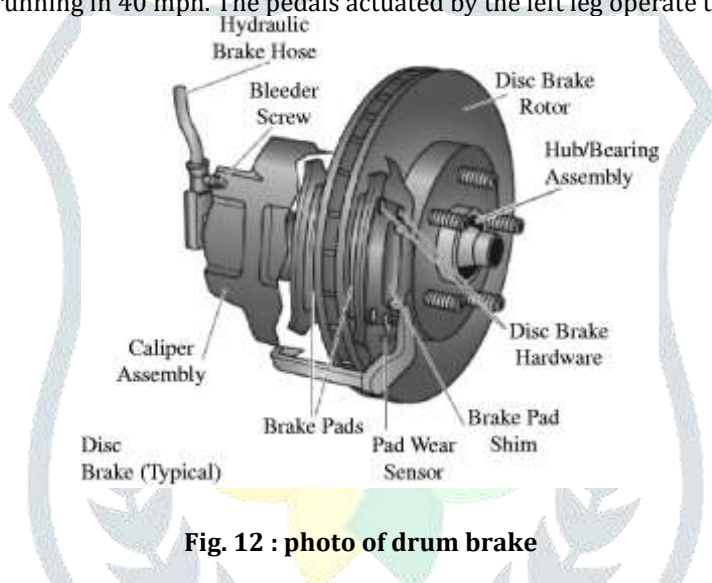
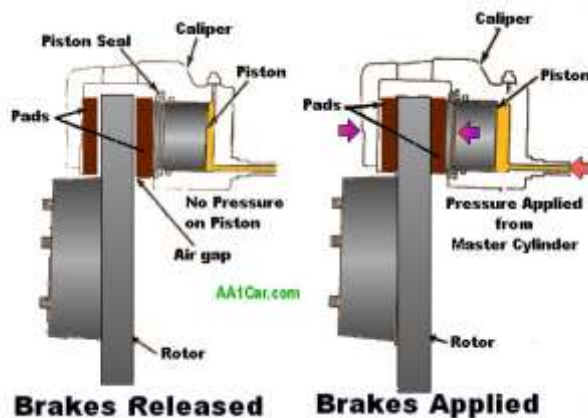


Fig. 12 : photo of drum brake



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