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Three Wheel Electric Car

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***Abstract*— initial thought of developing an automobile is to have new design and eco-friendly power transmission. So we decided to design and develop three wheel electric cars.**

Three wheel electric car as the name suggests the car runs on three wheels. We have cars with four wheels which occupy lot of space on roads and sometimes it's been a major difficulty to park cars in busy streets. We can observe in our daily life and using a four wheeler car by a single person rather than a group of people. Which create great loss of money on fuel and cost of vehicle, pollution by IC engines, greater traffic problems, increasing the space occupation on roads these are considered as major issues in four wheel IC engine cars So to eradicate these things we came up with a new thought, which is three wheel electric cars. It is easy to design when compared with four wheelers.

Preliminarily our object is to implement a basic prototype and afterwards with the help of this prototype we can extend our future work on building a real time three wheel electric car.

***Keywords*— Lead Battery, DC Hub motor, Motor Speed controller, DC Lead acid Battery**

I. INTRODUCTION

In recent years, the ever expanding field of electronics has played an important role in the development of the story. The advent of purely electronic device, rather than mechanical, has meant we're most accepting the machines with no moving parts runs only with electricity. This means we are better conditioned for ownership and an understanding of electric vehicles than we were at the turn of the 20th century. The simplicity and working of electric cars is at the very height of automotive engineering and as a result, they make piston engine appear dated and old fashioned. The same has happened with communications; the days of analogue devices have largely been replaced by a clearer and more advanced digital system.

The last ten years has seen a rise in technology advances unmatched in any previous generation. The popularity of mobile communications has pushed for better battery technology which is having an effect on electric cars too. New chemicals are being harnessed to create ever increasing fuel prices and an uncertain future of fossil fuel supply, not to mention political agendas and an ever more environmentally conscious populous all contribute to a larger picture where electric cars make sense.

Now, more than ever, electric vehicles are coming into the fray. They have become an almost obvious answer to the current mindset of the world in general .Electric powered vehicles now have the range they lacked the pace to keep up. They have the reliability and the efficiency to succeed and they are only just getting started. The rebirth of the electric car is taking place now.

II. LITERATURE REVIEW

The benefit to the delta setup is its inherent low cost. Most cars set up this way have the engine driving the rear wheels and leave steering to the front one. It's relatively easy (and inexpensive) to build a steering setup with only one wheel.

Three-wheel caries, by design, basically a triangle shape. Depending on where the passengers sit, the location of the engine, and the placement of other critical mechanical components, this means the car either has two wheels up front and one in the rear or two wheels in the rear and one up front. The engine can drive the single rear wheel or the two rear wheels, and the steering can be done either way as well[1].

The tadpole design is becoming more and more favored among auto designers for its stability, aerodynamics and ability to house a fuel-efficient engine. In fact, a number of current Hybrid and Electric concept vehicles use a three-

wheel setup along these lines. As cars get more eco-friendly, you may be seeing more and more three-wheelers on the road than ever before [2].

It's hard to pinpoint the invention of the electric car to one inventor or country. Instead it was a series of breakthroughs – from the battery to the electric motor – in the 1800s that led to the first electric vehicle on the roads. Electric vehicles first came into existence in the mid-19th century, in 1828, Ányos Jedlik, a Hungarian who invented an early type of electric motor, created a small model car powered by his new motor. Around 1832, Robert Anderson develops the first crude electric vehicle, but it isn't until the 1870s or later that electric cars become practical [3].

III. COMPONENTS USED

Mechanical components:

SL.NO	COMPONENTS	QUANTITY
1	FRAME	1
2	BEARING	6
3	Brake drum	1
4	Brake wire with lock	1
5	Foot pedal	1
6	DRIVE TRAIN	1
7	Stub axle	1
8	tie rod	2
9	bracket	2
10	brake wire with lock	1
11	Foot pedal	1
12	pinion of 13 teeth	1
13	sprocket of 25 teeth	1
14	Roller chain	1
15	spindle	2
16	steering rod	1
17	steering support	1
18	Steering wheel	1
19	Fabrication material	-

Electronic components:

SL. NO	COMPONENTS	CONFIGURATION	QUANTITY
1	Lead Battery	**(12 V , 70 AH)**	**4**
2	**DC** Hub motor	**240** Watts	**1**
3	Motor Speed controller	20-24 AH , 48 V	**1**
4	Throttle(Acceleration)	Foot pedal	**1**
5	**DC** Lead acid Battery Charger	220v **AC** to 48V **DC** converter	**1**

Frame (Chassis):

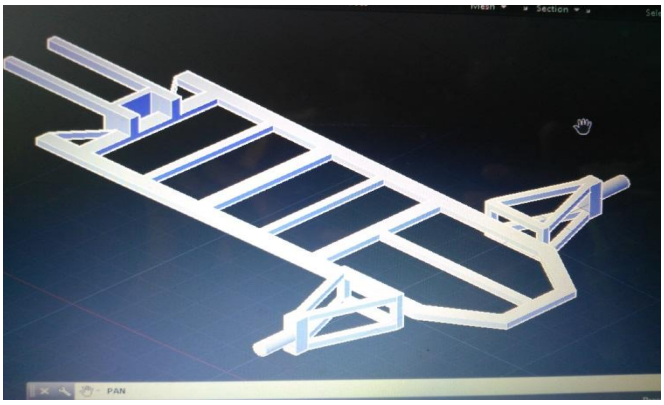
[DIMENSIONS]

Material : Steel.

Shape : Rectangular Hollow Block.

Width : 25.5 mm.

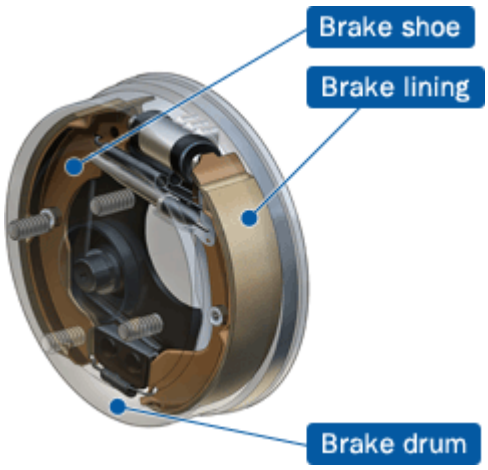
Breadth : 50.8 mm.



Brake:

We used rear wheel drum brake, This type of drum brake is known as "Duo-servo brakes".

A drum brake is a brake in which brake shoes with ling (friction material) attached to them is pushed by hydraulic pistons against the inner surface of a drum rotating together with the axle.



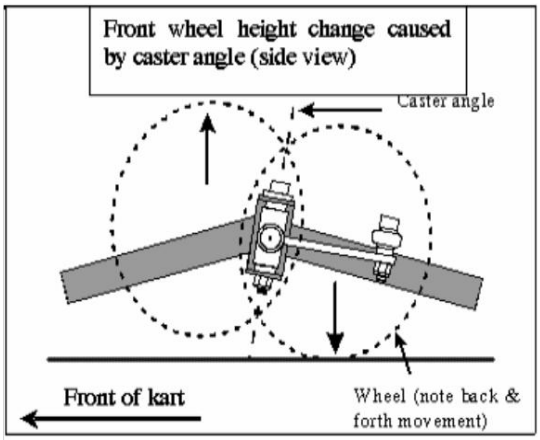
Duo-servo type-drum brake:

This type of Duo-servo type drum brake we were used in our car .Duo-servo type drum brakes are an improved version of twin leading construction, where two brake shoes are linked.

Steering System

Steering is another very important mechanical aspect of any vehicle. Steering is the term applied to the collection of components, linkages, etc. which will allow a vehicle to follow the desired course.

Castor Angle:

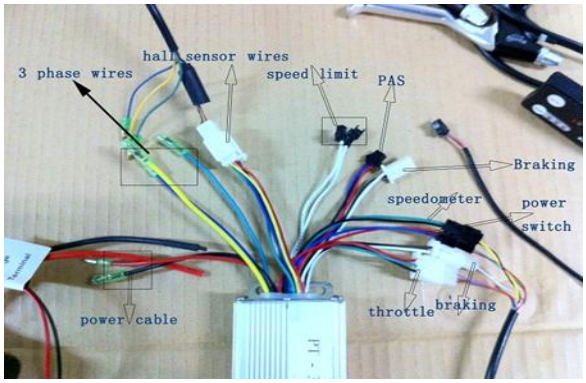


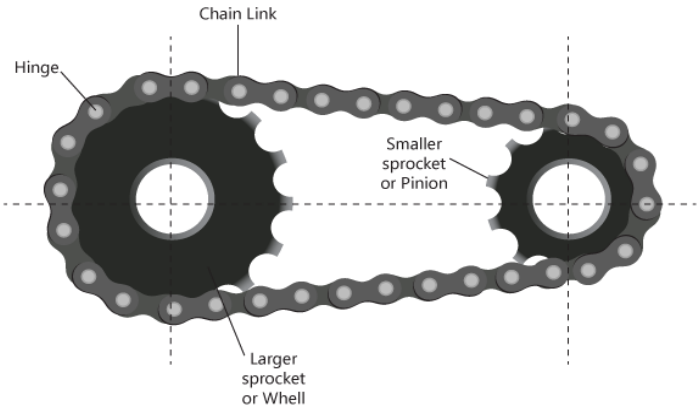
Castor angle is the angular displacement of the kingpin axis from the vertical axis of the vehicle measured in the longitudinal direction. It is the angle between the pivot line(in a car – an imaginary line that runs through the center of the upper ball joint to the center of the lower ball joint) and vertical.

Battery:

The lead–acid battery having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge currents means that the cells have a relatively large power-to-weight ratio. This feature, along with their low cost, makes it attractive for use in motor vehicles to provide the high current required by automobile starter motors.

Motor speed controller:





Tires:

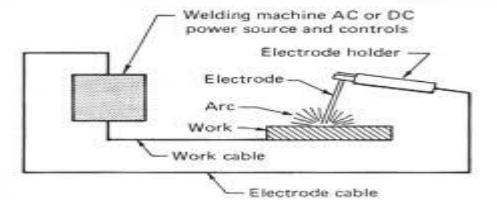
Tires will play crucial role in motion of a vehicle on the roads, the contact surface will of a tires and road should have a significant grip and also the number of tires we are providing will also considered because the center of gravity of an vehicle will allows to act on tires so that the placing of tires should be equilibrium in case of stability.

Chain Drives:

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of vehicles, particularly bicycles and motorcycles. It is also used in a wide variety of machines besides vehicles.

Arc welding:

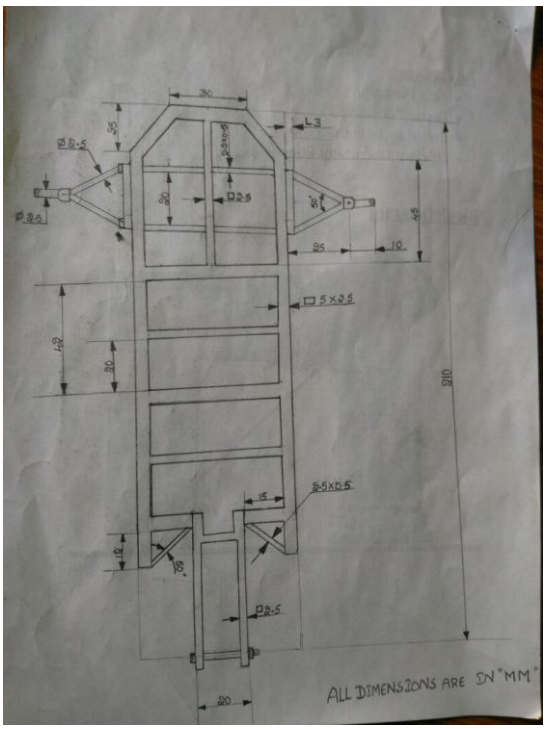
The arc welding is a fusion welding process in which the welding heat is obtained from an electric arc struck between the work(or base metal) and an electrode. The temperature of the heat produced by the electric arc is of the order of 6000°C to 7000°C. Both the direct current (D.C) and alternating current (A.C) may be used for arc welding, but the direct current is preferred for most purposes.



IV.ASSEMBLING

Procedure of assembling:

- Sequencing order of assembling process:
- Chassis design.
- Arrangement of wheels.
- Suspension attachment.
- Arrangement of rack and pinion steering.
- Power transmission system (chain drive).
- Power source.
- Accelerating throttle
- Braking system.
- Seating.
- Fabrication.



V.FABRICATION AND PAINTING

Fabrication:

In this process we have done two processes one is we have arranged the aluminum metal sheet for sides and front of our vehicle which has undergone through bending for design and spot welding of those sheets and another process is placing PVC hood clothing over top of the car which is generally seen in tractors and jeeps this is used because it has a specification of water proof resistance which is very necessary while driving in rains. And finally we have fixed a fiber glass panel.

This fabric is widely used to cover the top of the auto rickshaw which will provide protection against sun, dust, heat and rainfall. The offered fabric is made from single side poly vinyl chloride coated polyester

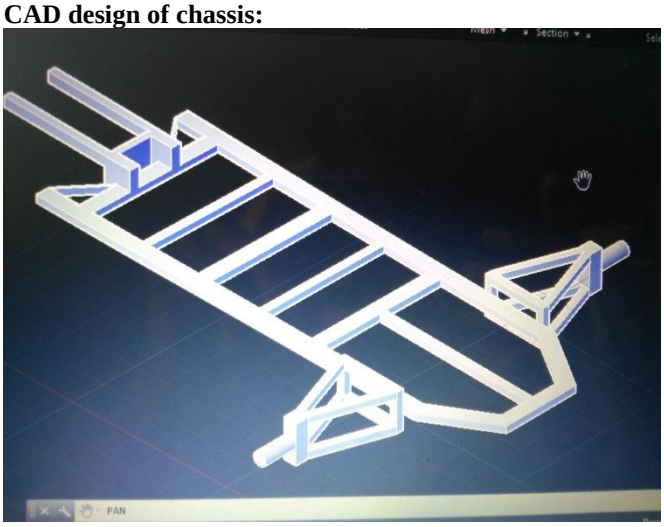
Features:

- Ultra violet protector
- Protection against weather
- Extra strength
- Protection from IR
- Withstands from moderate mechanical and chemical stresses

VI.DESIGN AND CALCULTION

Dimensioning of chassis:

CAD design of chassis:



Power calculations:

Force=μ_{rr}*m*g+1/2*p*A*Cd*v^2+m*g*sinϕ+m*dv/dt

=0.01*150*9.81*1/2*1.2*1.01*0.2*0.833*($0.833)^2$+150*0.13

=14.715+840+19.5

=43 N

Outer radius

r = 30 cm =0.3 m

Torque (T_L) = $\frac{43*0.3}{3.3}$

T_L=3.90 N-M

No. of revolution for 12 seconds then 12*60=720

P= $\frac{2*\pi*720*3.90}{60}$

P= 294 Watt

Availability=250 Watt motor

Final model:

VII.COST ESTIMATION

SL.NO	MATERIAL	COST(RS)
1	Frame	7000
2	Wheel	3000
3	Steering and rack and pinion	2900
4	Motor and controller	8700
5	4 Batteries(12V, 70AH)	20000
6	Fabrication	3500
7	Painting	1400
8	Electric accessories	1800
9	Seat,head lamps	1450
10	Labor	6000
11	Miscellaneous	3000
	TOTAL COST	**58750**

VIII.ADVANTAGES AND DISADVANAGES

ADVANTAGES:

- Renewable energy
- Low cost

- Simple to design three wheel and decreases the complexity of four wheel
- It can be used by anyone even without experience
- Easy to replace parts
- No emission.
- No Gas Required
- Safe to Drive
- Low Maintenance
- Reduced Noise Pollution

DISADVANTAGES :

- Short Driving Range and Speed
- Longer Recharge Time
- Silence as Disadvantage
- Battery Replacement
- One Seat.

IX. CONCLUSIONS

Hybrid cars are definitely more environmentally friendly than internal-combustion vehicles. Batteries are being engineered to have a long life. When the hybrid cars become more widespread, battery recycling will become economically possible. Research into other energy sources such as fuel cells and renewable fuels make the future look brighter for hybrid cars.

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