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Design & Fabrication of Electric Tricycle for Handicapped Person

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Abstract: Nowadays, it is difficult for the physically disabled or handicapped person to move to their destination. Generally the handicapped person found on the wheelchair transporting with the help of another person. It is necessary to provide the mobility to disabled person without the help of another person. Various hand driven tricycle is available in market, but that require more effort for handling and driving. A motorized tricycle is designed to solve the problem by providing motor to the vehicle. The basic design will be according to the existing manually operated tricycle. The whole body looks like a complete tricycle except the fact the manual operation is replaced by an automatic operation using motors.

Keywords: Travelling, Electric tricycle, Electric energy, DC gear motor, Handicapped person, reverse mechanism.

I. INTRODUCTION

Transportation is one of the most important factors in human being life. The abled person chooses there transportation according to their choice such as bus, car, rikshaw, bike, etc. But the disabled people cannot use it conveniently. They don't have much choices to get their transportation facility. Major amount of disabled people uses the tricycle as a transportation medium. But in present condition, most of the disabled people uses the hand driven tricycle. They have difficulty for the handling. Some motorized tricycle is also present in market used by disabled. But that are also have some problems for disabled and high cost that are uneconomical for lower class people. The existing motorized tricycle have the cost around Rs 25,000-30,000 (INR), but still have some problems like low speed, human effort, uncomfortable in sitting and revers problem. The tricycle gets stuck in soil in rainy season. And motor doesn't have so much torque to move the cycle. These are some of the problems that the researchers are trying to solve with the new tricycle design.

II. HISTORY

The disabled German man, Stephan Farffler built a three-wheeled wheelchair in 1655 or 1680, who wanted to be able to move himself. Actually he was a watch mechanic, so he should have to move in the room. He was able to create a vehicle that was powered by hand crank. The three-wheeled vehicle powered by pedal was developed by two French inventors in 1789; they called it tricycle, was the first time three-wheeled wheelchair called as tricycle. In 1818, British inventor Denis Johnson patented his design of tricycle. In 1876, James Starley developed the Coventry Lever Tricycle, which used three wheel, two small wheels on the right side and a large drive wheel on the left side, power was be supplied by hand levers. In 1877, Starley developed a new vehicle, he called the Coventry Rotary, which was "one of the first rotary chain drive tricycle". The recycling craze was started from the Starley's inventions. In 1879, there were "twenty types of tricycles and multi-wheeled cycles produced in England, and by 1884, there were over 120 different models produced by 20 manufacturers". The first front steering tricycle was manufactured by the company named as 'Leicester Safety Tricycle Company' of Leicester, England in 1881. The same tricycle was brought into the market for customer use having costing £18. The company of Leicester also developed a folding tricycle at the same time. The problem was at that time, is with women, they feel uncomfortable riding on high wheelers, because they wore long, flowing dresses at that time.

III. LITERATURE REVIEW

- 1) Ajit mohekar, they have designed an eco-friendly retrofitted wheelchair over the available wheelchair. They just work on sitting arrangement, hand movement on the wheelchair according to the height of sitting and hand rest for the comfort of user.
- 2) Swati Dhamale, she develops an eco-friendly electric tricycle or retrofitted scooter. She used some parts of the scooter like head of a moped, her tricycle drives on an electric energy without chain sprocket (chain mechanism). She used a hub motor to drive the tricycle which is attached to wheel.

- 3) Rahul sharma, this tricycle is powered by pneumatic as the conventional tricycle required human strength and effort to be applied on the pedal to propel the vehicle. A pneumatic tricycle is a compressed air operated vehicle which has a one-person capacity and these kinds of vehicle are specially designed for the purpose of mobility to single person.
- 4) P. R. Jawale, in their paper, they have explained different types of tricycle and their working operation with design and description also they have compared different types of tricycle like paddle, motorized, electric, solar, IC engine and motor power tricycle with each other and explained each once advantage and limitation with respect to other and describe different technologies used to produce an efficient tricycle.

IV. COMPONENTS

A. DC Motor

The motor is having 350-watt capacity with maximum 324rpm after considering losses. Its specification are as follows:-

- 1) Current rating: - 19.2amp.
- 2) Voltage Rating: - 24 Volts DC.
- 3) Weight: - 2.98 Kg.
- 4) Torque: - 11 N-m.
- 5) Air cooled.

B. Frame

The frame is made up of M.S. along with some light weight components it should be design to bear and overcome the stresses which may arise due to driving and impact loading. It is designed with robust base it can be hold the load along with the weight of the driving person uniformly.

C. Battery

The battery store the electrical energy by the help of transformer, transformer converts the A.C to D.C and store it in battery. battery supply D.C it on demand to motor, controller and other component which is run by electricity.

D. Controller

Controller is a device which controls the whole unit (motor, accelerator, Brake, headlights, horn, etc.). It is a 24V controller with a 40-amp current limit and 20V output, if battery voltage drops to 20V the controller will no longer provide power.

E. Braking System

The braking system which is using in our project it acts like a clutch or an electrical brake which runs on the electric supply provided by the DC battery with the help of controller when operator pressing the brake the push button get release and it cuts the power supply of motor (motor get stop) and support to this we have use the mechanical brake.

V. TYPES OF HANDICAPPED VEHICLE

A. Types Of Tricycle Available In Market



Fig (1); - Normal handicapped tricycle

This is a normal tricycle which is operated by human hand power which required high human effort. it cannot come reverse or we can say that this is a basic type of tricycle who has only motion in forward direction.



Fig (2); - This is a semi advanced tricycle which runs by electric energy but the disadvantage of this cycle is that this tricycle does not come in reverse direction.



Fig (3); - This is a solar operated tricycle which run by a solar energy but it also not come in reverse direction.

B. This Is Our Tricycle



Fig (4); - Tricycle which is operated by electric energy as well as it come in reverse direction by the help of removable lever.



Fig (5); - Connection of motor gear and freewheel by chain Fig (6);- Controller

VI. WORKING OF PROJECT

Two batteries of 12V are connected in series and supply electric charge to controller. Controller is connected with different components like motor, batteries, accelerator, horn, light, indicator, etc. Controller supply required voltage to different components for example to run motor 24V required but at the same time to run horn and light 12V required to each and this supply is controlled by controller shown in fig 6.

When controller supply required voltage to motor, motor get run in motor there is a gear attached to motor shaft which is connected with freewheel of right-hand rear wheel by chain as shown in fig 5.

Gear of motor run due to which it runs freewheel by the help of chain which exerting force on teeth of the freewheel and freewheel rotate the wheel in forward direction when force is exerted on the teeth of freewheel in forward direction but in the case when chain exert force in backward direction the wheel remains stationary.

VII. ADJUSTABLE HANDLE

Normally disabled person is facing problem when they entering and leaving the tricycle because previous tricycle has fixed handle. For eliminating this kind of problem, we have designed or constructed handle in such a way that it can rotate in three direction and also moves in forward and backward direction which is adjustable according to requirement. this gives a comfort to rider and full control on the steering. Adjustable handle is shown in fig 4.

VIII. REVERSE MECHANISM

The main objective of our project is reverse drive, we have provided a chain sprocket mechanism to take the tricycle in reverse direction. Mainly we have provided the larger gear of 44 teeth along with freewheel (18 teeth) and chain also. Construction of reverse mechanism is as shown in figure no. 8. In which freewheel is fixed on left rear wheel and the large sprocket fixed in front of that wheel, both can rotate and connected with the chain drive, the large sprocket has small portion extended as shown in figure number 7, in which hollow lever can insert or remove according to requirement for taking reverse.

When a lever is moves by hand, it exerted a force on extended portion which is joined to larger sprocket and it helps to rotate it, as chain is connect sprocket and free wheel so when sprocket rotated by hand lever it exerts force on teeth of freewheel by the help of chain.

The free wheel is fixed on wheel in such a way that when chain exert force on teeth in forward direction then the wheel is remain stationary but when force is exerted on backward direction on teeth then it rotate wheel in backward direction by this concept reverse of vehicle is achieved.



Fig (7); - Extended portion of Revers mechanism.



Fig (8); - hand lever of reverse mechanism.

IX. DETAILS OF THE AVAILABLE TRICYCLE

| Sr.no. | Type | Advantage | Disadvantage | Price (INR) |
|--------|------------------------|--------------------------|---------------------------------------|-------------|
| 1. | Normal Tricycle. | Cheap. | Human effort required & non-Reversed. | 7500/- |
| 2. | Semi Advance Tricycle. | Runs on electric energy. | Non-Reversed. | 35000/- |
| 3. | Solar Tricycle | Runs on a solar energy. | Non-Reversed. | 45000/- |

Details of our Tricycle

| Sr.no. | Type | Advantage | Price (INR) |
|--------|-------------------|------------------------------|-------------|
| 1. | Advance Tricycle. | Electric operated & Reversed | 22000/- |

X. FUTURE SCOPE

Tricycle is driven by the electric source. Although there are lesser chances of complete discharge of battery but providing an alternative power source will make the tricycle more convenient to drive, an alternative source can be installing a chain and sprocket mechanism, when battery is completely discharge then vehicle can be driven by an alternative source like a manually hand-operated tricycle. To make ease of drive, use of manual gear for the forward direction moment when the battery is completely discharged. Usage of high capacity batteries for long distance. As the space is limited in city's so it can be foldable or assemble and disassemble.

XI. CONCLUSIONS

Objective of project is to design an ecofriendly, light weight, less effort requires to run and also affordable to poor handicapped person is completed. The tricycle is fabricated and tested successfully on different parameter like running, charging of battery and comfort of operator or disabled person. We have eliminated problem faced by previous design while taking reverse by our project. As compare to other tricycle our tricycle is easy to operate and understand. By this tricycle handicapped person or disabled person can move to their desired destination by moving tricycle in forward and backward direction according to need. In this project disabled person can move in backward direction by applying less effort.

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