Mono Wheel Vehicle

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Abstract: *Mono* wheel is a one-wheeled single-track vehicle similar to a unicycle. However, instead of sitting above the wheel, the rider sits inside the wheel.Mono wheel as the name indicates consists of only one wheel. Driver of the wheel sits inside the wheel and the main principle involved is application of GYROSCOPE. The main aim of Monowheel is that it reduces the space occupied when a single occupied vehicle is necessary..Itis driven by an electric motor. Thus it can be considerd as environmental friendly. Mono wheel vehicle is a self balancing vehicle with a single wheel. The rider controls the speed by leaning forwards or backwards.We modified the the design of monowheelvehical in a compact manner while reducing the material and weight of the vehicle. Stability of the vehicle can be maintain at lower speed by means of additional supporting wheels.

KEYWORDS:*Mono wheel, Gyroscope, Environmental friendly, Single occupied, Self balancing.*

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INTRODUCTION

Electrical vehicles can become a best way for transportation. In the environment where atmospheric pollution increasing by conventional vehicle must be restricted, traffic conjunction is also a major issue and parking space is big concern especially in urban areas. Considering all these issues there is immense necessity of developing the transportation system that will be able to solve these problems Developing a one-wheeled electric vehicle which has features that can over-come all the problems mentioned above since it has small longitudinal length. Moreover, they are suitable for all age groups; and does not require any registration,taxes.Most humans can learn to ride a bike without any problem because humans are skilled to balancing laterally left to right and the gyroscopic effect of the wheels makes it easy to stay up once on the move. Remove one of the wheels to make it a unicycle and the tendency to topple backwards or forwards around the single axle is almost impossible to avoid. Seasoned unicyclists manage it by using the directly connected pedals to constantly adjusting the wheel backwards and forwards underneath them. This vehicle is potentially easier to ride than the unicycle. Nevertheless, piloting a monocycle is a challenging task. In this article, we discuss the history of the monocycle. Although many potential problems were inherent in their design, monocycles were adapted to accept motors.

STRUCTURE OF PAPER

The paper is organized as follows: In Section 1, the introduction of the paper is provided along with the structure, important terms, objectives and overall description. In Section 2 we discuss Design and related topics, In Section 3 we haveliteracy survey. Section 4 consists of Construction of Mono Wheel Vehicle. Section 5 tells us about the future scope and concludes the paper with references.

OBJECTIVES

The main objective of our project is to reduce the fuel consumption and to reduce the weight of the vehicle. To increase the stability of the vehicle at low speeds. To bring down the frictional losses by reducing the overall number of mating parts. With our project we increased the stability at low speeds and novality in design has achived.

DESIGN

Design of Mono Wheel

Themono wheel vehicle with an effective power transmission system has to be designed such that it can be handled and controlled by a single person even in the rest position. The main and basic constraints that are being taken into consideration are

1. Height of the person riding the vehicle
2. Maximum weight that vehicle withstands.

3 Power Transmissions

2.1 Height of the person riding the vehicle :

According to thesurveyconductedbyan self-governing organization average height of the person in India is 1.67m. This includes the people from both the genders .So the vehicle has been designed for people whose height lies in the range of 1.6m (5′ 2″)-1.8m (5′ 9″).The average length of a leg person is 1.0m and the height variation is mainly due to the variation in the growth of upper part of the body. So the vehicle accounts to a mean diameter of 1.9m of which 0.8m consists of the transmission system and the lower part of the body i.e. the legs and the lower abdomen manage this area of the vehicle and the upper part of the body occupy the rest of the area. The key advantage of this design is that the rider can easily balance the entire vehicle with the help of his legs and the person can feel comfortable while riding the vehicle.

2.2 Maximum Weight the vehicle canwithstand:

The vehicle that is fabricated should be able have a specification of the weight that it can bear .This is the Maximum weight bearing capacity of the vehicle. So, we have taken into consideration that the maximum weight of the rider to be 80Kgs. By fixing the weight of the rider static structural stress analysis is done to check the strength of the design and determining the maximum stresses acting thereby deciding material that is to be used for fabrication hasbeen determining by considering a factor of safety of 4.76 At end of this step the material that would withstand the load of 80kgs with a factor of safety of 4.76 is ASTM A106 GRADE B.

MECHANICAL PROPERTIES	GRADE B
Tensile strength, min, (MPa)	415

Yield strength ,min (MPa)	240
Elongation.min,(%) (L/T)	30/16.5

TABLE 1: Material properties

COMPONENTS	GRADE B
MANGANESE 0.29-1.06	0.29-1.06
CARBON, MAX	0.30
PHOSPHOROUS, SULPHUR, MAX	0.035
SILICON, MIN	0.10
10 CHROME, COPPER, NICKEL, MAX	0.40
MOLYBDENUM, MAX	0.15
VANADIUM, MAX	0.08

TABLE 2: CHEMICAL COMPOSITION

2.3 Power transmission:

In our project power is generated through an electric motor. We are using DC motor to rotate the wheel by using chain drive. Motor drive is used to supply amplified power to DC MOTOR. The direction of the rotation of motors is controlled by the motor controller. Power supply plays a vital role in any electrical system. Therefore batteries are used to provide power to the system

LITERATURE REVIEW

Since 19th Century Mono wheels have actually been around in one form or another. They began with an early bicycle design After all, if something works with two wheels, could it also work with just one? In 1869 the first mono wheel designs appeared and the Craftsman Rousseau of Marseilles built the first monocycle.

The mono wheel with an effective power transmission system has to be designed such that it can be handled and controlled by single person even in the rest position. The main and basic constraints that are being taken into consideration for the height of the person riding the vehicle and maximum weights that the vehicle can withstand. The mono wheel was recognized as a difficult means of transportation: One publication remarked that the vehicle was "impracticable for ordinary mortals". Garavaglia was first time mortised in 1904 in unicycle. It works on the principle of self- balancing technique, it was generally use for fun and entertainment purpose from 1860 to 1930, but after 1930 it starts to use as serious transportation because a one-wheel vehicle is potentially more efficient than a two wheel The Rousseau mono wheel can be viewed as a unicycle riding on a track attached to the inner diameter of a large wheel by pedalling the" unicycle "the outer wheel revolves moving the unit forward no steering mechanism was provided In the early 1900s, a group of American inventors attempted to develop a propeller-driven monocycle known as the D' Harlingue mono wheel on a restored 1924 circus mono wheel for some time, it was believed that this is Jumpin' JoeGerlach, on a circus machine fitted with a 160cc Honda engine, but it is now clear it is really Hubert Broaches Basically, the fine machine has been recently built by David Southall. It is called the Red Max. David says its construction was inspired by the 1924 circus mono wheel. David has now kindly provided more details: The wheel itself is a 5-foot diameter hoop of 2-inch tube. It was a bit beyond what I can do so was made for me by The Angle Ring Company. The pulleys on which it runs were custom-made by AED rollers. Everything else was cut, bent and welded in my shed!

Fig 1

CONSTRUCTION

Firstly, we started our structure by making a big, metallic wheel with 130cm diameter using a tube of 40mm diameter. Then, we lined the metallic wheel with a rubber in order to achieve having the benefits that all the tyres have on the street. Also, due to the fact that the wheel is big in size, we took 4 tyres from small motorbikes and we cut them as well as we glued the one with the other in order to form a tyre.

Afterwards, we made 4wheels with a bearing using MS shaft and onwhich the big wheel rolls. These four wheels were attached with the inside part of the wheel on a framework. On this framework, a DC motor is palced which had the capacity of 24V. This motor using a chain, enables a rubber wheel to move sothis wheel enables the big wheel to move as well. Therefore, the rider sits inside the wheel

Fig 2. Rolling operation

Fig 3. Construction of outer wheel

Fig 4. Tire arrangements

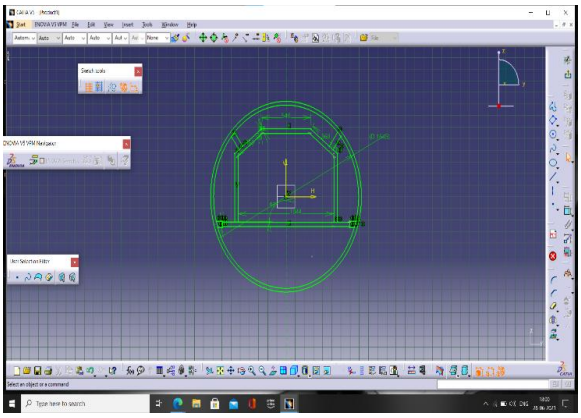

Fig 5. Sketch in catia

4.1 Components used :

1. Outer wheel
2. Sprocket
3. Friction wheel
4. Supporting Wheel
5. Chain
6. Foot rest
7. Frame
8. DC motor 24V
9. 12V 12 AMP Battery

4.1.1 Outer Wheel :

Specifications: Diameter:-5.4 feet, Pipe diameter:-1.5 inches.

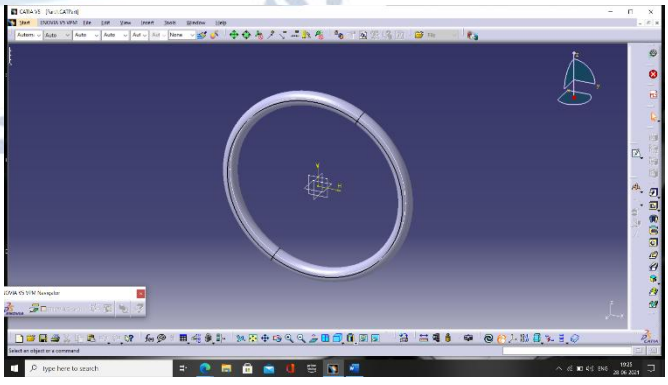

Fig 6. Outer wheel

4.1.2 Sprocket :

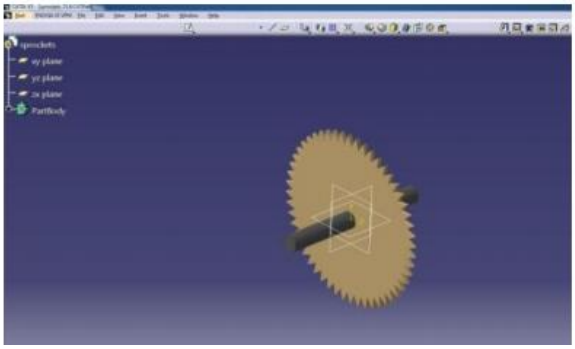

Fig.7 Spocket

4.1.3 Friction wheel :

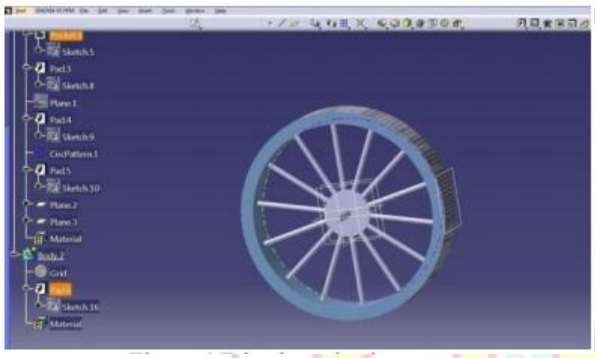

Fig 8. Friction wheel

4.1.4 Frame :

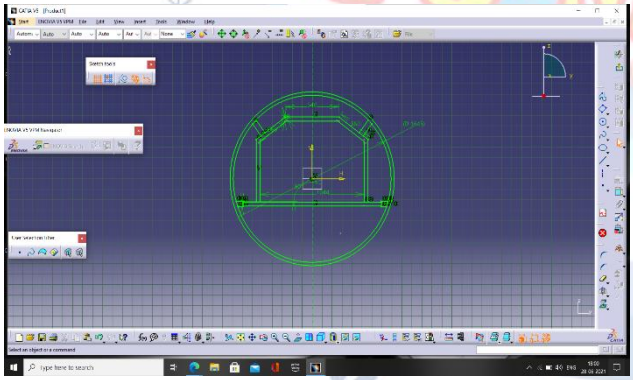

Fig 9. Frame

4.1.5 Chain :

Fig 10 Chain

Limitations:

A monowheel's lack of other wheels and somewhat awkward stance makes handling difficult. A rider will typically want to keep his or her feet close to the ground so the monowheel doesn't tip over completely. In addition, if it has a powerful engine, it's unlikely that all of the power can be used in this kind of setup. Its lackof stability when forward motion is taken away makes braking especially difficult, too.

Risk of "Gerbiling":

In most designs, if the driver accelerates or brakes too hard, it is possible that the force applied overcomes the force of gravity keeping the rider at the bottom of the wheel, sending the rider spinning around the inside of the wheel. This is known as gerbiling because it has some similarity to the situation of a gerbil running too quickly inside of a hamster wheel. Visibility issues. In driver-inside designs,the rider is always facing the inner rim of the wheel, which can obstruct the view of oncoming hazard

Modifications :

The following modifications and doned to reduce the limitaions of previously designed mono wheel vehicles

- Supporting wheels are arranged such that stability of the vehicle increases at low speed
- Weight of the vehicle is reduced
- Engine is replaced with dc motor such that cost and pollution is reduced
- Breaking system is modified such that sudden impact is reduced while braking.
- Design of frame is modified to reduce cost and material required.

FUTURE SCOPE AND CONCLUSION

Conclusion for the futuristic scope Monowheel or Monobike is a personal transporter that can carry a person to move from one place to another within large areas like industries, space centers, shopping complex areas, etc. We have built a compact, efficient, powerful, and cheaper version with keeping budget in mind This Monobike is an extremely affordable budget variant and any person can get hands-on it. Since it has fewer components it can be easily dismantled and also less maintenance cost.

- In the future work, the load carrying capacity can be increase.
- Distance travelled can be maximize.
- Charging time can be improved.
- Weight can be further reduces

Design can be modified such that gribling effect can be nullified

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