

DESIGN AND FABRICATION OF MONOWHEEL

¹ K.GIRI BABU,²P .NAGA GOPI,³N.S.V RAGHURAM

¹Assistant Professor,²UG Student,³UG student

^{1,2,3}Department of Mechanical Engineering,

^{1,2,3}KKR & KSR INSTITUTE OF TECHNOLOGY AND SCIENCES, Vinjanampadu, Guntur, A.P, INDIA.

Abstract: Mono wheel is design used to be a personal vehicle to carry a human operator that stands on and drive it. In industries humans should walk long distance to travel from one work site to another work site which will consume lot of human energy. By using this mono wheel we can reduce human energy. We can use this mono wheel in industries to travel from one place to another place. In recent years, because of the global pollution and energy shortage, automobiles and motorcycles are no longer the best for transportation. The device which we proposed will consume energy from battery which will reduce pollution and it is very small compared to other vehicle. The proposed mono wheel will work on self-balancing technique. To implement the concept of self-balancing we are going to use microcontroller which get input from two sensors to measure the angle by using gyroscope and vibrations by using accelerometer. Self-balancing technique is one of the intelligent characteristics for dynamical system to achieve to play important application in many humanoid robots and military projects.

IndexTerms–3 roller pipe bending,welding,bending,grinding,drilling,braking system.

1. INTRODUCTION:

This paper proposes a monowheel looks like something out of a science fiction movie, but monowheel are in fact real, today, mono wheels are generally built and used for fun and entertainment purposes, but from the 1860s through to the 1930s, they were proposed for use as serious transportation. The idea may sound extreme, but the science behind monowheels is solid, at present, because of the surging consciousness of pollution and energy shortage crises, automobiles and motorcycles are no longer the best for transportation. In addition, saving energy in order to determine the problem of fuel depletion is becoming increasingly important. Even industries and manufacturing companies that spread over huge areas restrict the usage of means of transport by their employees within their area to avoid the risk of pollution due to emissions of harm air. To meet those needs, research on eco-friendly transportation has been increased. Electrical vehicle technology has a step towards fulfilling these goals. In an effort to get people out of their cars, cities are trending to allow personal mobility products to mix with pedestrian traffic. With the mono wheel, you're not limited to the street or the bike lane. It's a transitional vehicle – it goes most places where a person can walk or ride a bike. In a two-wheel mode of transportation, two systems (wheels) affect motion. Typically one wheel provides the force to control speed, while the other handles changes in direction, steering. A Monowheel is a one-wheeled single-track vehicle similar to a unicycle. However, instead of sitting above the wheel, the rider sits either within it or next to it. The wheel is a ring, usually driven by smaller wheels pressing against its inner rim. Most are single-passenger vehicles, though multi- passenger models have been built. Hand-cranked and pedal powered mono wheels were patented and built in the late 19th century; most built in the 20th century have been motorized. Some modern builders refer to these vehicles as monocycles, though that term is also sometimes used to describe motorized unicycles. Today, mono wheels are generally built and used for fun and entertainment purposes, though from the 1860s through .to the 1930s, they were proposed for use as serious transportation In view of the efficiency of bicycles, it is natural to ask if a one-wheeled vehicle provides any advantages.

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2. LITERATURE SURVEY:

Title: Design and Fabrication of Self Balancing single Wheeler Vehicle using Gyroscope.

Objectives: Stabilization of a two wheeled vehicle plays a vital role in the complex Transportation system. Gyroscopes can deliver a major contribution towards stabilization of single wheeler vehicle. It has been speculated that gyroscopically stabilized vehicles would have higher safety with respect to normal two wheelers. The dynamic stabilization of a single-wheeled vehicle requires that a torque acting on the vehicle naturally be neutralized by a torque produced within the vehicle by a gyroscope. The gyroscope here is used as an actuator, not a sensor, by using precession forces generated by the gyroscope.

Methodology: There are various types of parallel spin axis wheeled two-wheeler vehicles. They are typically used for commuting or for pleasure. Lighter vehicles with smaller engines are usually cheaper than their heavier counterparts and is the primary means of transport in a lot of Asian countries. Nowadays maximum road accidents are of the two wheelers.

Result: The final model of the self-balancing vehicle design is shown below. This design has been tested at different rpms of the disc and also with different weights to see that the vehicle is balancing. This paper presents design and fabrication of the two-wheeler self-balancing vehicle which is capable of balancing itself under application of external forces and loads. The vehicle balances itself under various conditions like forced tilt of the vehicle.

Title: Design and Analysis of Front Mono Suspension in Motorcycle.

Objectives: The main part for a vehicle suspension is the shock absorber, which manufactured for reducing shock impulse. Shock absorber work on the principle of fluid displacement on compression and expansion cycle. They are used in motorcycles for providing better handling, prompt braking, safety and comfort by keeping the passengers isolated from road noise, bumps and vibration. The common type of the front suspension in motorcycle is Telescopic forks which are replaced by the Mono Shocks that gives a superior vehicle handling and provides safety while braking.

Methodology: The suspension system is the main part of the vehicle, where the shock absorber is designed mechanically to handle shock impulse and dissipate kinetic energy. In a vehicle, shock absorbers reduce the effect of traveling over rough ground, leading to improved ride quality and vehicle handling. While shock absorbers serve the purpose of limiting excessive suspension movement, their intended sole purpose is to damp spring oscillations. Hysteresis is the tendency for otherwise elastic materials to rebound with less force than was required to deform them.

Result: We have designed a Shock Absorber used in bike and we have modeled it using 3D parametric software called Pro/Engineer. The shock absorber design is modified by reducing the diameter and stress analysis is performed. The stress value is lesser in our designed spring than in original which adds an advantage to our design. By comparing the results in the table we could analyze that our modified front suspension has reduced in weight and it is safe. This invention overcomes the prior art disadvantages and provides an esthetically pleasing adjustable front end spring support.

Title: The Development of Self-Balancing Controller for One-Wheeled Vehicles.

Objective: The purpose of this study is to develop a self-balancing controller (SBC) for one-wheeled vehicles (owvs). The composition of the OWV system includes: a DSP motion card, a wheel motor, and its driver. In addition, a tilt and a gyro, for sensing the angle and angular velocity of the body slope, are used to realize self-balancing controls. OWV, a kind of unicycle robot, can be dealt with as a mobile- inverted-pendulum system for its instability.

Methodology: In recent years, because of the surging consciousness of global pollution and energy-shortage crises, automobiles and motorcycles are no longer the best for transportation. In order to fit the daily required and improve above problems, exploring new energy or developing lighter and innovative mobile carriers are beginning to be known as new trends.

Result: In recent years, because of the surging consciousness of global pollution and energy-shortage crises, automobiles and motorcycles are no longer the best for transportation. In order to fit the daily required and improve above problems, exploring new energy or developing lighter and innovative mobile carriers are beginning to be known as new trends.

Title: Fabrication of Mono Roué.

Objective: A **mono wheel** is a one-wheeled single track similar to uni cycle. However, instead of sitting above the outer cycle, the rider sits inside the wheel. The wheel is a ring, usually driven by uni-cycle which is pressed against to the outer wheel. It was designed as a single-passenger vehicle, or a multi-passenger vehicle has been built in 19th Century. Hand-cranked and pedal-powered mono wheels were built in the late 19th century; most built in the 20th century have been motorized. Some modern builders refer to these vehicles as the **monocycle**, though that term is used to describe motorized unicycles.

Methodology: Today, mono wheels are generally built and used for fun and entertainment purposes, though from the 1860s through to the 1930s, they were proposed for use as serious transportation. In a two-wheel mode of transportation, two systems (wheels) affect motion. Typically one wheel provides the force to control speed, while the other handles changes in direction, steering. For a mono wheel, both direction and speed are controlled through the same physical apparatus this generally makes steering more difficult.

Result: Leaning the most common steering solution is that the rider must lean towards his intended direction of travel to turn, and then centralize his weight again once the turn is complete. At speeds faster than a walk, lightly dragging a foot on the ground will cause the wheel to lean to the opposite side. Drag the other foot to bring it back upright. Steerable propellers, which could provide both steering and power to move the vehicle.

3. MONOWHEEL:

Monowheel is a one-wheeled single-track vehicle similar to a unicycle. However, instead of sitting above the wheel, the rider sits either within it or next to it. The wheel is a ring, usually driven by smaller wheels pressing against its inner rim. Most are single-passenger vehicles, though multi-passenger models have been built. Hand-cranked and pedal powered mono wheels were patented and built in the late 19th century; most built in the 20th century have been motorized. Some modern builders refer to these vehicles as monocycles, though that term is also sometimes used to describe motorized unicycles.



4. INTRODUCTION TO CATIA:

Initially, CATIA name is an abbreviation for **Computer Aided Three-dimensional Interactive Application**. We had already said in the introduction of historical, that the French Dassault Systems is the parent company and IBM participates in the software and marketing, and catia is invades broad industrial sectors, and has been explained in the previous post position of CATIA between 3d modeling software programs.

CAE (computer aided engineering)

Version that most of the people works on it now is catia v5 or fifth version, which is a rewriting and revision the code of the fourth edition. For the fifth version, there are versions from 1 to 20, for example, catia v5 r17, it means catia fifth edition version seventeenth, while years system was adoption in the sixth edition, for example, catia v6 2011 means catia sixth edition version of year 2011. Catia consists of modules each module specialized in specific design field.

Sketcher:

This module is responsible for the implementation of two-dimensional shapes, in preparation for make a three-dimensional commands on it.

Part Design:

This module is responsible for converting two-dimensional graphics to three-dimensional objects which is most famous in Catia and is closely linked with sketcher module. The part design Module it is considered from most important modules, that used by the designer to get the additional advantage from cad programs, which is stereotaxic drawing or three-dimensional drawing.

Assembly:

This module is responsible for assembling the parts previously produced in Part Design, and it is most important for those who work in the field of machinery design or design in general, **because it is the one who shows the inter-relationships between the parts of the machine or any mechanical establishment.**

Stress Analysis:

This module is responsible for testing parts designed to withstand the loads expected occurrence on it, and shows how the mechanical parts are affected by the colors, where they can learn the most dangerous points in terms of emotion through the distribution of colors.

Drafting:

This module is responsible, for converting what you see on the screen to standard engineering drawings can be traded in the workshop for manufacturing or save them for documentation.

Surface and Wireframe:

With this module surfaces can be drawing with zero size and weight and has its uses in the aerospace, automotive, ships and Mold Design.

Simulation:

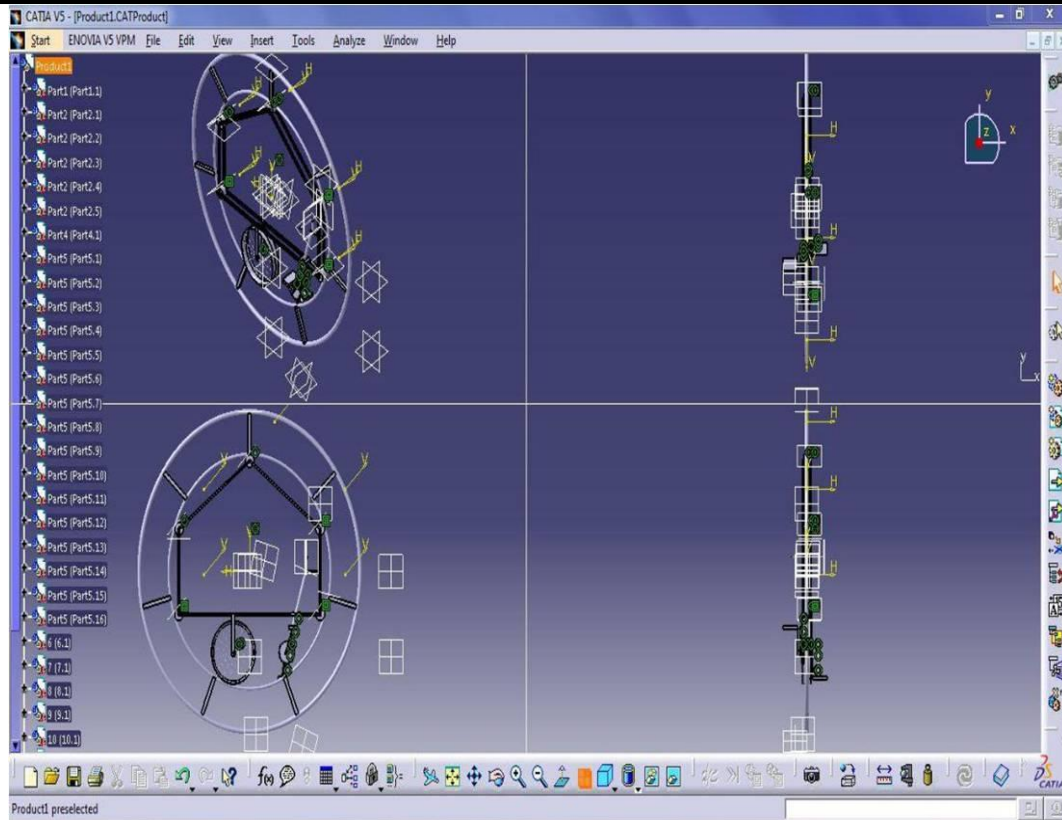
This module is responsible for obtaining a similar movement of the natural movement, which is expected to occur during the actual operation of the machine or mechanical establishment whatever.

Free Style:

Which is a free drawing, product designers needs it, such as Mobile or furniture or antiques designers and other modules such as:

Sheet Metal, Mold Design, Welding, Aerospace Sheet Metal.

The surprise is that all of the above follows the one field which is mechanical design field, while there are other fields such as:



5. CLASSIFICATION OF BENDING:

Pipe bending machines are typically human powered, pneumatic powered, hydraulic assisted, or electric servo motor. In the pipe bending operation the tube may be supported internally or externally to preserve the cross section of the pipe. In operations where there is flexibility in the shape of the pipe, the pipe does not need to be supported, however there will be some deformation in the both the cross section of the overall pipe and the wall thickness in different areas of the bend.

Pipe bending techniques are varied and offer different advantages and disadvantages depending on the function of the bend and the type of material being bent. Some use mechanical force and some use heat treatment, the most common are as follows:

- Press Bending
- Rotary Draw Bending
- Mandrel bending
- 3 Roll Bending
- Bending springs
- Heat induction bending
- Sand packing/hot-slab bending

5.2 THREE ROLLAR BENDING:

3-roll bending is also used for producing work pieces with large bending radii. The method is similar to the ram bending method, but the working cylinder and the two stationary counter-rollers rotate, thus forming the bend. Normally there are 2 fixed rollers and one moving roller and the work piece is passed forward and backward through the rollers while gradually moving the working roller closer to the counter rollers which changes the bend radius in the pipe. This method of bending causes very little deformation in the cross section of the pipe and is suited to producing coils of pipe as well as long sweeping bends like those used in powder transfer systems where large radii bends are required.

6.1 CLASSIFICATION OF WELDING PROCESSES:

There is another way of classifying welding and allied processes which is commonly reported in literature. Various positive processes involving addition or deposition of metal are first broadly grouped as welding process and allied welding processes as under.

Welding is a process of joining metallic components with or without application of heat, with or without pressure and with or without filler metal. A range of welding processes have been developed so far using single or a combination above factors namely heat, pressure and filler. Welding processes can be classified on the basis of following technological criteria.

- Welding with or without filler material
- Source of energy for welding

Arc and non-arc welding

Fusion and pressure welding

A weld joint can be developed just by melting of edges (faying surfaces) of plates or sheets to be welded especially when thickness is lesser than 5 mm thickness. A weld joint developed by melting the faying surfaces and subsequently solidification only (without using any filler metal) is called “autogenous weld”. Thus, the composition of the autogenous weld metal corresponds to the base metal only. However, autogenous weld can be crack sensitive when solidification temperature range of the base metal to be welded is significantly high (750o - 100o C). Following are typical welding processes in which filler metal is generally not used to produce a weld joint.

TABLE I. Laser beam welding

TABLE II. Electron beam welding

TABLE III. Resistance welding,

TABLE IV. Friction stir welding.

Arc welding: is the fusion of two pieces of metal by an electric arc between the pieces being joined – the work pieces – and an electrode that is guided along the joint between the pieces. The electrode is either a rod that simply carries current between the tip and the work, or a rod or wire that melts and supplies filler metal to the joint.



6.3 surface grinding

The machine is suitable for grinding of the lateral areas of squared mono- and multi crystalline silicon work pieces in the format 125 x 125 mm² and 156 x 156 mm², with four parallel arranged grinding aggregates. workpiece lengths of 400 up to 1000 mm can be processed.

The fully automatic grinding machine excels by following advantages:

- automatic change of format • equipped with two loading areas for manual and fully automatic loading, for instance with the help of an industry robot
- geometric correction by parallel arranging of grinding aggregates • very high repeatability

6.4 hand grinding

Grinding is a material removal and surface generation process used to shape and finish components made of metals and other materials. The precision and surface finish obtained through grinding can be up to ten times better than with either turning or milling. Grinding employs an abrasive product, usually a rotating wheel brought into controlled contact with a work surface. The grinding wheel is composed of abrasive grains held together in a binder. These abrasive grains act as cutting tools, removing tiny chips of material from the work. As these abrasive grains wear and become dull, the added resistance leads to fracture of the grains or weakening of their bond. The dull pieces break away, revealing sharp new grains that continue cutting. The requirements for efficient grinding include.

Drilling and boring

7.1 classification of drilling

Drilling machines: classification, constructional features, drilling & related operations, types of drill & drill bit nomenclature, drill materials.

At the end of this lesson, the students will be able to:

- (i) State the basic purposes of use of drilling machine
- (ii) Classify the types of drilling machines
- (iii) Illustrate the general kinematic system of drilling machine and explain its working principle
- (iv) State and visualize the various common and other possible applications of drilling machines basic purposes of use of drilling machines • drilling machines are generally or mainly used to originate through or blind straight cylindrical holes in solid rigid bodies and/or enlarge (coaxially) existing holes: 9 of different diameter ranging from about 1 mm to 40 mm 9 of varying length depending upon the requirement and the diameter of the drill 9 in different materials excepting very hard or very soft materials like rubber, polythene etc.

7.2 RADIAL DRILLING MACHINE:

A radial drilling machine is a geared drill head that is mounted on an arm assembly that can be moved around to the extent of its arm reach. The most important components are the arm, column, and the drill head. The drill head of the radial drilling machine can be moved, adjusted in height, and rotated.

Boring

In machining, boring is the process of enlarging a hole that has already been drilled (or cast), by means of a single-point cutting tool (or of a boring head containing several such tools), for example as in boring a cannon barrel. Boring is used to achieve greater accuracy of the diameter of a hole, and can be used to cut a tapered hole.

PEDAL AND RIM ARRANGEMENT

8.1 PEDAL ARRANGEMENT

A pedal is presented that was designed specifically for the evaluation of cycling technique of different cyclists in real conditions. Most of the instrumented force pedals referred to in research literature have been designed for laboratory use, where pedal weight and dimension have not been considered critical characteristics. By means of this new instrumented force pedal, which is externally identical to one of the most popular clip less pedals, cycling forces under real conditions are measured. The interest in this pedal lies in the fact that it can be used in road trials like the sprint or climb, where tridimensional movements must be considered. Some measurements obtained in hill climb cycling, such as maximum normal force and force distribution during crank revolution, are also presented and discussed.



8.2 rim arrangement

The rim is commonly a metal extrusion that is butted into itself to form a hoop, though may also be a structure of carbon fiber composite, and was historically made of wood. Some wheels use both an aerodynamic carbon hoop bonded to an aluminum rim on which to mount conventional bicycle tires.

Metallic bicycle rims are now normally made of aluminum alloy, although until the 1980s most bicycle rims - with the exception of those used on racing bicycles - were made of steel and thermoplastic.



TRANSMISSION:**9.1 chain drive**

The chain drive is a way transmitting mechanical power from one place to another. It is often used to convey power to the wheelers, particularly bicycles and motorcycles. It is used in a wide range of variety beside vehicles.

**9.2 SELECTION PROCESS**

Obtain required information. Before a silent chain drive is selected, it is essential to obtain all the listed items of information. Note that the first 10 items are same as for roller chain.

1. Source of input power
2. Type of drive equipment
3. Power to be transmitted
4. Speed and size of drive shaft
5. Desired center distance and drive arrangement
6. Means of center distance adjustment
7. Available lubrication type
8. Adverse environmental conditions.

9.3 centre distance

The preferred centre distance for a silent chain drive is 30 to 50 times the pitch. The centre distance should be adjustable to take up slake chain caused by wear. The centre distance should adjustable at least 2 pitches. If a fixed centre must be used, consult a chain manufacturer.

9.4 chain length

It will give chain length accurate to within + or $-\frac{1}{2}$ pitch. If a more precise chain length is needed, equations for exact chain length may be found in Manufactures literature. Chain length must be an integral number of pitches. An even number of pitches is preferred. An odd number of pitches requires the use of an offset link, and offset link, reduce the capacity of the chain.

BRAKING SYSTEM:**10.1 mechanical braking system**

To get objective statements about the behavior of bicycle brakes under defined conditions, there is the need to find another test option besides the outdoor tests, in which only subjective statements from the rider or measured field data under not reproducible conditions can be found. Therefore, a test bench was built which makes it possible to investigate different brakes under identical conditions (dry and wet) in the laboratory. With the developed equipment, a hysteresis [1] function can be logged, that gives information about the relation of the applied lever force, caused by the rider's hand/fingers, and the measured brake force which decelerates the rider-bike-system.

HANDLE SYSTEM**11.1 HANDLE ARRANGEMENT**

The name is also called a bike of rural people. Bicycles have evolved significantly over the past decades in pace with technological advancement. However the comfort of cyclists has not much attempted in many designs. Although ample research has been reported on comfort for other means of transportation, cyclist's perception of comfort has received scant attention in the scientific literature. This paper discusses the ergonomic aspects that can be incorporated in the design of a bicycle handle. The first step is to determine which factors contribute to comfort when riding a bicycle which results in human performance and fatigue. It has been found out by means of a survey with enthusiast cyclists that comfort is influenced by factors related to the cyclist (driver position, handle adjustments, body parts).

Advantages of mono wheel

1. Mono wheel is design used to be a personal vehicle to carry a human operator that stands on and drive it
2. In industries humans should walk long distance to travel from one work site to another work site which will consume lot of human energy.
3. By using this mono wheel we can reduce human energy.
4. We can use this mono wheel in industries to travel from one place to another place.
5. In recent years, because of the global pollution and energy shortage, automobiles and motorcycles are no longer the best for transportation.
6. The device which we proposed will consume energy from battery which will reduce pollution and it is very small compared to other vehicle.
7. The proposed mono wheel will work on self-balancing technique.
8. To implement the concept of self-balancing we are going to use microcontroller which get input from two sensors to measure the angle by using gyroscope and vibrations by using accelerometer.

Result:

Industries. Mainly in space centre from lab to another lab the distance will be very long and scientists willet tried to move in such large areas. If they use petroleum vehicles it cause huge pollution that will affect many instruments in space centre to avoid this we can use a personal vehicle which consume only electrical energy rather than petroleum products. Mono wheel is small vehicle while compare to other transport devices. The main unique thing form other vehicle is that it consists only one wheel. The design is completely different from other vehicles it is eco free device.

CONCLUSION:

Considering the feedback we removed the seat so that more than one can ride the mono wheel. From ergonomic study to make it possible for any height of a person ranging from 5'2" to 6'2" to cycle it we provided long horizontal plate for seating purpose. We have proved the theoretical concept that if one pedaling cycle is done the outer wheel rotates by 0.8 revolutions so that we can travel a distance of 5m. We have realized that the weight of outer wheel is so huge that we cannot pedal for more than quarter revolution.

FUTURE SCOPE:

In future Mono wheel is a research project in which continuous study on the existing design in the future helps it to increase its effectiveness to a greater extent. It can be further improved with a motor driven technology and can be extensively used in the transport purposes of the industrial works to a greater extent. When driven with the help of IC engine we can develop a competitive mode of transport.

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