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A Review of One Wheel Motorbike

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Abstract - *When it comes to self-balancing personal transportation devices, it's look like the Solo wheel, Honda U3-X, Uno and Segway could all be in for a little competition. Portland, Oregon based RYNO Motors is currently in the process of launching its own entry in the cool-little-electric-vehicles race, which it appropriately calls the RYNO. It has just one wheel. Of nothing else, that feature will definitely get riders noticed. Unlike some of its potential competitors, the RYNO is intended to take the place of a motorcycle. With a top speed of 25 mph and a range of up to 30 miles, it's intended for short distance, low speed jaunts, possibly even being ridden amongst pedestrians. The RYNO has a lithium phosphate battery that is said to recharge in just an hour and a half. The weight of RYNO is 160 Lbs and the carrying capacity is upto 250 Lbs. It's turning radius ranges from zero to three feet (0.9 meters), and it can manage inclination up to 30 percent. It's auto balance system will first of all provides warning to the user, and then temporarily take control of machine. RYNO Motors is currently in the process of hand building 50 limited edition pre-production bikes. When the production version is ready to ship, which should be early next year, it's estimated price will be approximately US$3500.*

Key Words: Construction of Mono wheel, Specification, Luggage Carrying Capacity

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. As the price of petroleum products growing now-a-days, there is a need for cheaper and more efficient form of transport. [4]

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. [1]

Therefore RYNO is created, What is a RYNO? Well, in some ways it's less than a motorcycle, but in other ways, it's so much more. One-wheeled, electric-powered-vehicle. A machine that has no greater footprints than you do. Capable of operating at speed up to 25 miles per hour. The first personal mobility device that's lets you mix and mingle into a crowd, naturally. [7]Six years ago, Portland-based engineer Chris Hoffmann was driving with his 13-year-old daughter Lauren to go fishing. On the journey, out of the silence, Lauren said, "Daddy, I've been thinking about this one-wheeled motorcycle I saw in a video game. Could you actually build something like that?" What happened next changed his life.In the next few months, Chris begins shipping the first production version of the RYNO, a self-balancing, one-wheeled US$3500 personal mobility device that has caused tidal waves of interest across the internet with global distribution and manufacturing on several continents in planning. [1]

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 RYNO, 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. For a monobike, both direction and speed are controlled through the same physical apparatus. [2][6]

1.1. Literature Review

Monowheels have actually been around in one form or another since the 19th century. They began with an early bicycle design. After all, if something works with two wheels, could it also work with just one? [4]

The first monowheel designs appeared as early as 1869. In 1869 the Craftsman Rousseau of Marseilles Built the first monocycle. Several of these featured a seat for the rider with pedals connected to a small wheel, which was in turn connected to the outside wheel. The rider pedals the small wheel, and that drives the large wheel, creating motion. Even at that time, the monowheel was recognized as a difficult means of transportation: One publication remarked that the vehicle was "impracticable for ordinary mortals". [6]

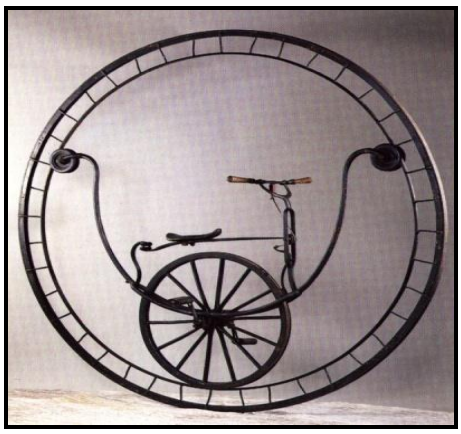

Fig-1: First Monowheel Model

But as you know, some ideas never die -- no matter how questionable they are. Up next, we'll look at monowheels today and concepts planned for the future. Today, monowheels are still around. [6]

2. CONSTRUCTION

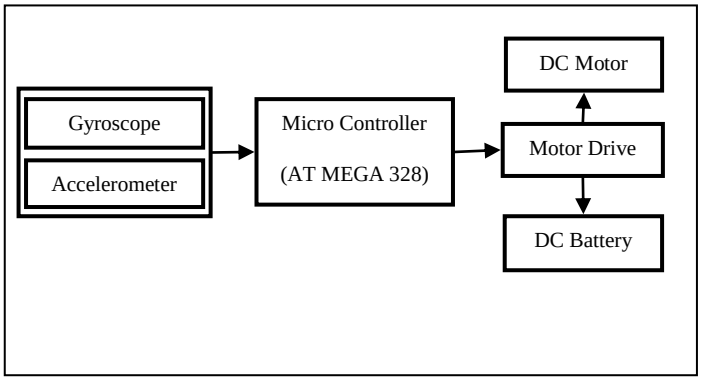

Fig-2: Block Diagram of Monobike

Monobike move with the help of DC battery. It works on the principle of self-balancing technique with the help of micro-controller. The self-balancing technique is done by using microcontroller. Program is written in microcontroller. The microcontroller will execute each and every step of program and it give the require output to move the dc motor. The applied force can be sensed by theMPU-6050 sensor which contains a MEMS accelerometer and a MEMS gyro in a single chip. Accelerometer is used to sense the change of velocity with respective time. Gyroscope is used to sense the change in angle. 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.The readings from the sensors are collected and are given to the controller. The controllers continuously process the output and provide the relevant motor power required to drive the wheels in the certain direction. [1]

2.1. Diagrammatic Construction And Working

Referring Fig.3 is a side elevation of a self-balancing monobike in accordance with the present invention is shown. In this illustrative embodiment, the self-balancing monobike includes handle bar 102, display 104, headlights 106, a storage basket 107, a tire 108, a seat 112, a rear handle bar 114, rear handle bar 114 provides a hand hold for users and facilitates holding, moving, or loading the monobike. A foot platform 116 disposed on a side stirrup 122, and a wheel fork 120. [1]

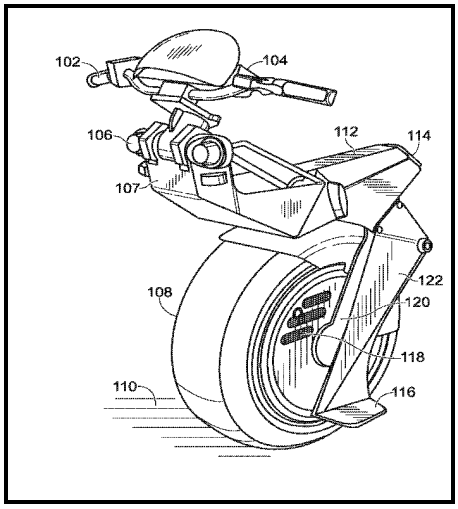

Fig-3: Diagrammatic construction of RYNO

2.2. Components Of Monobike

2.2.1. Batteries With Motor Drive Assembly

Referring to the alternative embodiment of Fig. an illustrative motor bracket assembly with three batteries attached is shown.

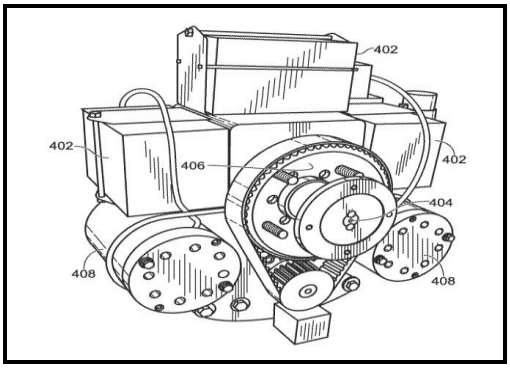

Fig-4: Motor Bracket Assembly with Batteries

2.2.2. Motor Drive Assembly

Fig.5 is a side view of an illustrative motor drive assembly, in accordance with the present invention two electric motor drive sprockets coupled to a jackshaft sprocket by belts. In the assembled unicycle wheel, motor drive assembly is disposed inside the wheel. A first electric motor *a* and a second electric motor *b* are attached to a mounting bracket. The drive sprocket of first electric motor *a* is coupled to a jackshaft sprocket by belt. The drive sprocket of second electric motor *b* is coupled to jackshaft sprocket by belt. The line in Fig indicates the centerline, i.e., the axis of rotation for the assembled unicycle wheel.[7]

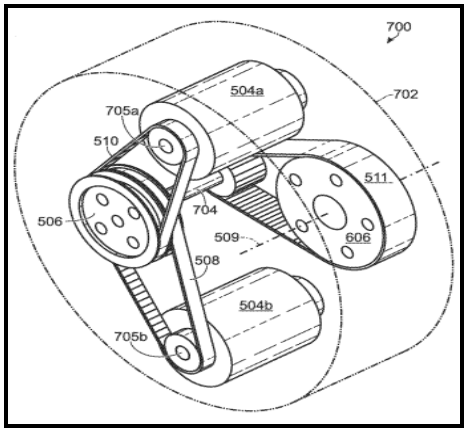

Fig-5: Motor Drive Assembly

Fig-6 shows a side view of an illustrative wheel hub assembly with motor drive in accordance with the present invention, showing two electric motors *a*, *b*, attached to mounting bracket, and a jackshaft coupled to a main drive sprocket by a belt. A plurality of threaded studs extends outwardly from main drive sprocket as shown. In this way, the rotational energy of electric motors *a*, *b*, is transferred to jackshaft sprocket and then to main drive sprocket. A pair of motors can be seen at the lower four and eight o'clock positions. A large timing belt sprocket at the center has four lug-nuts that mount to the wheel. The main sprocket rotates around the center. (not shown in this figure). [7]

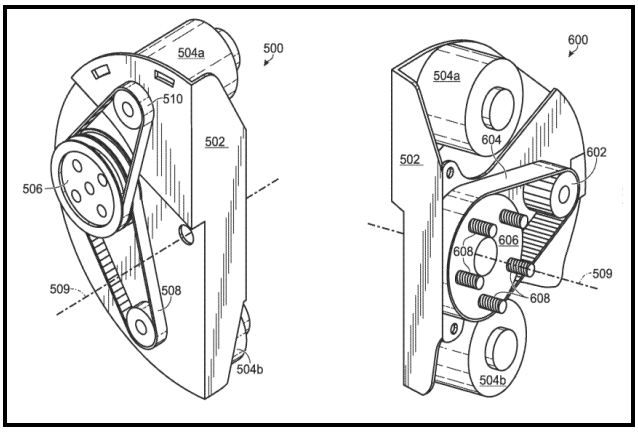

Fig-6: Wheel Hub Assembly with Motor Drive

2.2.3. Brakes

Power and control wires are connected to a sophisticated micro-controller that is looking at the tilt angle, rider input at the brake lever and the motor controller to decide how hard to apply the brake pressure to stop the monowheel while keeping it from pitching forward. [7]

2.2.4. Handlebar and steering mechanism

Fig.7 shows parts of the steering system. More particularly, handlebars are coupled to body,body is coupled to wheel forks, and wheel forks are coupled to the wheel. A steering linkage is coupled between handlebars and wheel forks.

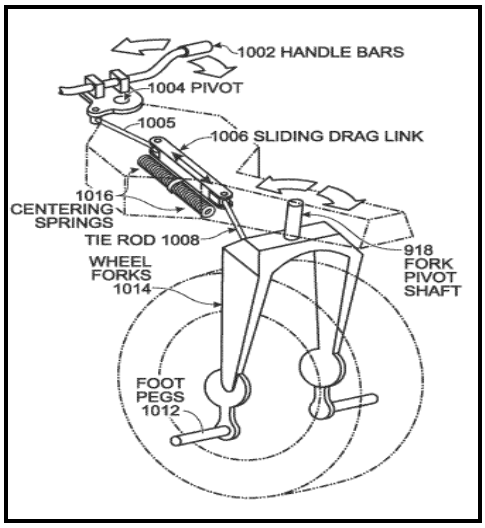

Fig-7: Fork Pivot Mechanism

It is noted that when a rider turns handlebars the center of mass of the rider/monobike combination changes, and this also affects the direction of travel. Turning handlebars to the right or left respectively pushes or pulls on wheel forks thereby exerting forces to change the direction of travel. [7]

2.2.5. Wheel

RYNO is outfitted with a full sized sports motorcycle tyre having 25 inches diameter offering all the grip and traction you need to ride RYNO. The trend is best suited for pavement, but also functions on tile, carpet and other varied surfaces. [8]

2.2.6. Gyroscopic

'Gyre' is a Greek word, meaning 'circular motion' and Gyration means the whirling motion. A gyroscope is a spatial mechanism which is generally employed for the study of precessional motion of a rotary body. Gyroscope finds applications in gyrocompass, used in aircraft, naval ship, control system of missiles and space shuttle. The gyroscopic effect is also felt on the automotive vehicles while negotiating a turn. A gyroscope consists of a rotor mounted in the inner gimbal. The inner gimbal is mounted in the outer gimbal which itself is mounted on a fixed frame as shown in Fig.1. When the rotor spins about X-axis with angular velocity ω rad/s and the inner gimbal precesses (rotates) about Y-axis, the spatial mechanism is forced to turn about Z-axis other than its own axis of rotation, and the gyroscopic effect is thus setup. The resistance to this motion is called gyroscopic effect.

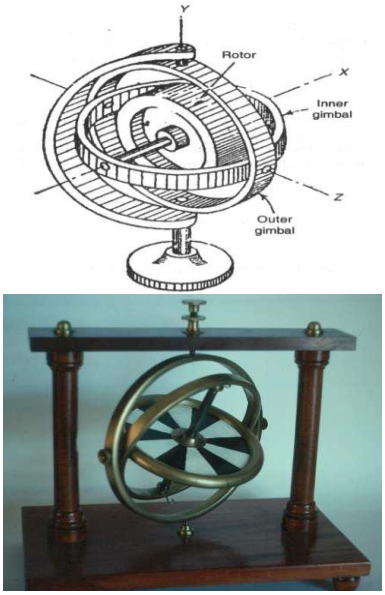

Fig-8: Gyroscope mechanism

3. SPECIFICATION

3.1. Hidden Motors and Drive System

Adding to the look of magic, RYNO's redundant electric motors and dual slide-out battery system are both cleverly contained within the wheel itself. [6]

Fig-9: Hidden Motors and Drive

3.2. LED Headlights

RYNO's bright billeted machined aluminum LED headlights will pierce through the city night, making sure you can not only see where you're going – but cars, bicyclists and pedestrians can see you too. [6]

Fig-10: LED Headlights of Ryno

3.3. Seat Handlebar Combination

Adjustable Seat is there, Different riders, different needs. The adjustable seat accommodates riders short and tall. 'Attitude Adjustment Button' tool is unique to the monobike concept. [6]

3.4. Lean Forward Pull Back

Ready to accelerate? It's simple. A suitable forward shift of your body weight and the RYNO gently begins to move in the direction you want to go. RYNO doesn't do anything more or less than you want it to do. A gyro sensor tells the RYNO'S RYDE-EX control system to drive the wheel forwards or backwards to stay under the center of gravity. Lean forward, and the gyro tells the processor that the bike is falling forward. As a result, it will roll forward until the rider allows the bike to come back to zero. [6]

3.5. Park Anywhere

When you've arrived at your location, parking the RYNO is as easy as stepping off, deactivating the Balance System, setting the RYNO down on the built-in parking bumpers, and putting on the parking brake. If you're parking RYNO on any sort of incline, it's important to engage the parking brake for the safety of your RYNO and others around it. [6]

Fig-12: Parked Ryno

3.5. Digital Handlebar

To wake the RYNO up, place the key in the switch at the right side of the handlebar mounted display and turn the key to either "N" for novice mode or "A" for advanced mode (the bike is not in balance yet).

Fig-12: Digital Display Handlebar

To let the RYDE-ex. software know you have the bike under control momentarily press the silver button once at the left of the display. You will hear an audible ascending tone and the bike will snap into balance. Before getting on, check to make sure by firmly pressing down on the handlebars to feel the resistance. [6]

3.6. Comfortable Suspension

Ryno has a very comfortable seat suspension system which feel the rider very comfortable. [6]

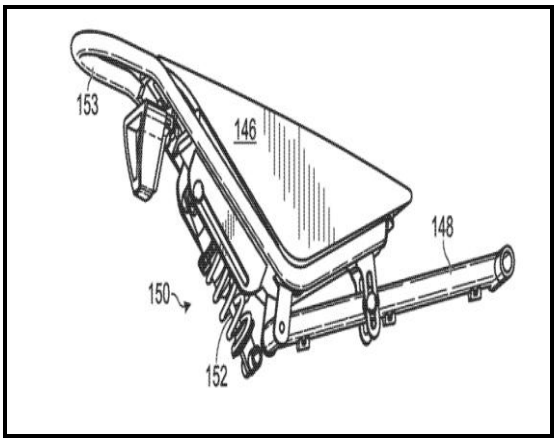

Fig-13: Suspension System

3.5. Luggage Carrying Capacity

Even though you ride the RYNO solo – it doesn't mean you can't take some things with you. The custom-designed RYNO rack is compatible with most bicycle pannier-style bags, so you can hit the grocery store, carry your laptop, or whatever else you need when you're out and about. [6]

Fig-14: Luggage on Ryno

4. ADVANTAGES

1. Easily check remaining battery charge, system status, and other useful information on the easy-to-read, back-lit digital display.
2. To connect your personal electronic gear such a tablet or phone there is a standard 12v DC socket just like in the dash of your car.
3. For Parking that's another clever aspect of the Ryno's design. The front of the vehicle's frame comes together in a rubber-footed bar. Simply tipping the vehicle forward rests it on that bar like an oversized kickstand.
4. Custom-designed Steel Frame- The RYNO's industrial-strength, robot-welded steel frame offers the necessary structural rigidity and high performance. Sleek, minimal, functional… or as they say in Detroit, it could sustain a nuclear blast.
5. The weight of RYNO is 160 Lbs and the carrying capacity is upto 250 Lbs.

5. DISADVANTAGES

1) For a mono wheel, both direction and speed are controlled through the same physical apparatus this generally makes steering more difficult.
2) Limited capacity, monobikes tend to be larger than a car of similar carrying capacity. Most have been kept small by being built to carry only one rider.
3) The most common steering problem 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.

6. APPLICATION

1) For fun, entertainment and adventure purpose.
2) In bigger industries and companies.
3) It is used in Portland Police Department.

7. CONCLUSIONS

RYNO is self-balancing personal transporter which has ability to carry a person to move from one place to another within the large campus. The vehicle will balances itself by moving the device in forward direction or backward direction base on the readings from sensors. Thus the monowheel is much helpful in the large campuses like airports, universities, space centers and in large industries etc. This system reduces the work of humans as well as no pollution it provides ecofriendly environment.

8. FUTURE SCOPE

Portland police will soon be cruising community festivals on a single wheel, following a deal with Ryno Motors to lease the company's one-wheeled electric vehicle beginning next summer. The lease with the Portland Police Bureau "validates the bike as being rugged and reliable and seen as having a useful purpose," [1]

The deal with the Portland Police Bureau follows weeks of interest in the Ryno cycle, which will be featured as the ride of choice for musician-cum-actress Carrie Brownstein in an upcoming episode of Portlandia. It also has a cameo in a patent office in this season's final episode of Leverage, was recently profiled for a yet-to-publish article on the hugely popular AOL-owned engadget.com and landed one of two coveted "future" spots in the "London Transport Museum" for a history of transportation exhibit. One of Ryno's prototypes will be on display there for a year. [1]

Fig-15: Ryno's Conceptual Model for Portland Police Department

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REFERENCES

1) Sreevaram Rufus Nireektion Kumar, BangaruAkash and T. Thaj Mary Delsy "Designing the Monowheel by Using Self Balancing technique", 2016, (Pg.1, 4, 20,)
2) MaanyamSairam, SeetharamSandeep, SaiPrahallad, S. SachinGogoi, Sukumar Reddy "Fabrication of Mono Roue", Oct 2014, (Pg.1, 17, 18)
3) Manpreet Singh, Ankit Sharma, AnshulAgnihotri, PranabeshDey, DigantaKalita, SushobhanShekharDutta "An Investigation Study Based on Emerging Demand of Electric Unicycle Vehicles", May 2015, (Pg.3, 4)
4) Gheorghe DELIU, Mariana DELIU "MONOWHEEL DYNAMICS", November 2009, (Pg.3)
5) M.V. Muthukumar, R.Rajesh, ArunPrakash R. "Conceptualization and Ergonomic Analysis of a Typical Unicycle", March 2015, (Pg.17)
6) http://rynomotors.com/
7) http://www.google.co.in/patents/US8800697
8) https://en.wikipedia.org/wiki/Monowheel

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