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Fabrication of 360° Rotating Four-Wheel Vehicle

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ABSTRACT

The study aims for development of a system to reduce the turning radius of vehicles. The goal of this project Ids to reduce the space required for parking by allowing vehicles to be parked in any direction. This is achieved through the use of a chain mechanism and DC motors that enable the constant rotation of the wheels in any direction. The rotation of the wheels is controlled by a DPDT switch which ensures precise and smooth movement. This project aims provide a practical solution to the problem of limited parking space which can be applied in a variety of settings such as residential and commercial areas.

Key: *Chain mechanism, DC motors, DPDT switch*

INTRODUCTION

The use of 360° wheel rotations is a cutting-edge technology that is gaining popularity due to its convenience and practicality. This system allows the wheels to rotate in any direction making it easier to manoeuvre in tight spaces and park in difficult to reach areas. The chain mechanism used in this system connects the wheels to the DC motors which control the movement of the wheels. By turning the wheels in any direction, the vehicle can move with greater agility and precision enabling it to park in even the most challenging locations.

In addition to its practical applications this technology also has the potential to reduce damage to cars caused by tight parking spaces. By allowing for greater flexibility and control over the vehicle drivers can avoid collisions with other cars and obstacles. Overall, the use of 360^0wheel rotations is a game changer in the world of parking and automobile design. As more and more cities and urban areas become crowded this technology is set to become an essential tool for drivers and car manufacturers alike. With its innovative approach to mobility the future looks bright for this exciting new technology.

LITERATURE SURVEY

Here are some literature surveys on fabrication of 360-degree rotating four-wheel vehicle:

Arun Kumar *et al.* [1] proposed a system with chain drive, a battery, a chain sprocket, a DC motor, a wheel, a bearing, an iron pipe, and steering. With the assistance of a steering mechanism and a DC motor, this system first stops the vehicle and then turns the wheels in the desired direction. DC motors are used in the wheels of this vehicle to move it forward and backward, and a battery provides the DC motor with electrical power. It has turning radius nearly equivalent to negligible of length of the vehicle itself. This arrangement is to be helpful in hospitals, miniature industries and also on railway platforms.

Kachhi A. [2] proposed the idea of all

electric concept of vehicle is that if it becomes a reality would prove to be lot of fun to drive in the city. The vehicle works on 8 electric motors four motors attached uniquely to each wheel and it can rotate 360 degrees. The wheels of the car magnetically coupled and it is controlled by magnetic fields. Hence the car can rotate festally and effectively. The concept of an all-electric vehicle with 8 electric motors, each uniquely attached to each wheel, and capable of rotating 360 degrees, sounds like an interesting idea. The magnetic coupling of the wheels and control by magnetic fields also adds a unique aspect to the design.

Moudgil *et al.*[3] 360° rotating car to beat the matter of parking zone. The fact that this car has a turning radius of zero degrees indicates that it turns in the same direction as the vehicle's axis of gravity when in motion. Where it's standing. No extra space in required to revolve the vehicle. So, vehicle is to be turned within the space equal to the length of the vehicle itself.

Mali *et al.*[4] introduced zero turn four-wheel components in this undertaking individuals have utilized DC engine and wheels to vehicle pivot 360 degrees at an equivalent position so in this errand the drive is to coordinate of DC motor and wheels. It seems like you are describing a project that involves using four-wheel mechanisms with DC motors to enable a vehicle to turn 360 degrees in place, without moving forward or backward. The authors of this project, Malaita. [4], likely designed and implemented a system that incorporates these mechanisms to achieve the desired result

Kumar *et al.*[5] the statement suggests that some vehicles, such as pickup trucks and buses, are equipped with a mode in which the rear wheels turn in the opposite direction to the front wheels when travelling at slow speeds. This mode is particularly helpful when driving in hilly regions, as it can improve maneuverability and reduce the turning circle radius by up to 25%. Additionally, it can also be beneficial in congested city conditions, where U-turns and tight streets can be difficult to navigate. By using this mode, drivers can make these types of turns more easily and with less risk of collisions or accidents.

Bhishika *et al.* [6] stated that "The 4WS system performs two distinct operations: in-phase steering, whereby the rear wheels are turned in the same direction as the front wheels, and counter phase steering, whereby the rear wheels are turned in the opposite direction. The 4WS system, also known as four-wheel steering, is a technology that allows all four wheels of a vehicle to turn and steer simultaneously. As stated by Bhi Shika et al. [6], this system performs two distinct operations: in-phase steering and counter-phase steering

Lohith *et al.* [7] The statement suggests that at high speeds, when subtle steering adjustments are made, both the front wheels and rear wheels of a vehicle turn in the same direction. This causes the vehicle to move in a car-like manner rather than following a curved path.

This phenomenon is known as "crabbing" and can occur in vehicles with all wheel steering systems or other advanced steering technologies. While crabbing can be useful for maintaining stability and control at high speeds, it can also be an indication of issues with the vehicle's alignment or suspension. Drivers should always be aware of their vehicle's behaviour and seek professional help if they notice any unusual movements or vibrations while driving.
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METHODOLOGY

- Fixed frame
- Sprocket & Chain
- Dc motors
- Battery
- DPDT switch (Double Pole Double Throw)

Fixed Frame [[Figure 1]
The fixed frame forms the base of the 360-degree wheel rotation vehicle. This frame is made of mild steel (MS). All parts are attached with the frame. The MS thickness is 2mm and width is 12.5mm. The length is 450mm and height is 300mm

Fig 1: Fixed frame

Sprocket & Chain [Figure 2]
A sprocket is a wheel with a series of teeth or cogs around its circumference, which meshes with a chain or other transmission element to transmit rotary motion. Sprockets are commonly used in mechanical and industrial systems to transfer power from one rotating component to another. They can also be found in bicycles, motorcycles, and other types of machinery that require power transmission. Sprockets come in various shapes and sizes, and their teeth can be straight or curved depending on the application. The term "sprocket" is often used interchangeably with the term "gear," although gears typically have teeth that are shaped differently than sprockets.

Fig 2: Sprocket and chain

DC Motors [Figure 3]
This is 60 RPM DC geared motors for robotics applications. Very easy to use and available in standard size. A DC motor that rotates at 60 RPM (revolutions per minute) means that the motor shaft completes 60 revolutions in one minute. The actual speed of the motor will depend on various factors such as the voltage applied to the motor, the load on the motor, and the motor's design. If you want to control the speed of the DC motor, you can do so by varying the voltage applied to the motor using a motor controller or a

variable power supply. Alternatively, you can also use a gear train to change the speed of the motor output shaft. It's worth noting that the speed of a DC motor can vary depending on the load applied to it. The motor's speed will decrease as the load on the motor increases, and vice versa. Therefore, it's important to choose a motor with an appropriate speed rating based on the intended application and load requirements.

Fig 3: DC motor

Battery [Figure 4]

A lithium-ion battery (Li-ion battery) is a type of rechargeable battery that uses lithium ions as the primary component of its electrochemical cells. Li-ion batteries are commonly used in portable electronics, such as smartphones, laptops, and tablets, as well as in electric vehicles and other applications. The structure of a Li-ion battery typically consists of two electrodes - a positive electrode (cathode) and a negative electrode (anode) - separated by an electrolyte. The electrodes are made up of materials that can intercalate lithium ions (i.e. allow the ions to move in and out of the material). During charging, lithium ions move from the cathode to the anode, and during discharge, the process is reversed, with the ions moving from the anode to the cathode. Li-ion batteries have several advantages over other types of rechargeable batteries, including high energy density, low self- discharge rates, and a longer lifespan. However, they also have some disadvantages, including a risk of thermal runaway (i.e. overheating and catching fire or exploding) and a tendency to degrade over time, particularly if not stored or used properly. Overall, Li-ion batteries have become a popular choice for a wide range of applications due to their high energy density and long lifespan.

Fig 4: Battery

DPDT Switch (Double Pole Double Throw) [Figure 5]

A DPDT switch (Double Pole Double Throw switch) is an electrical switch that has two poles, each with two positions, which can be used to switch between two different circuits or to control two different devices simultaneously. Each pole of the switch has two terminals,

called "throw" or "position". In the centre position, both throws are disconnected from any circuit, while in the other two positions, each throw is connected to one of two possible circuits. The DPDT switch is often used to control the polarity of a circuit, such as in reversing the direction of a DC motor, or to switch between two power sources. It can also be used in audio applications to switch between different signal paths or to mute a signal.

Fig 5: DPDT switch

WORKING

It sounds like you're describing a vehicle that is powered by a battery and controlled by a control unit. The vehicle has six motors, with two motors connected to each of the vehicle's front wheels and back wheels, respectively. The four motors are used to run the vehicle, while the other two motors are used to rotate the vehicle's wheels to a specific degree using a chain drive arrangement. The control unit has two switches that allow the operator to control the vehicle's movement. One switch controls the vehicle's forward and backward movement, while the other switch controls the rotation of the vehicle's wheels in degrees. When the operator activates the wheel rotation switch, the motor connected to the chain drive arrangement turns the wheels to the left or right side. When the vehicle is parked, the body remains stationary, and the wheels rotate. To achieve this, the left motor connected to the chain drive arrangement turns, causing all four wheels to rotate simultaneously. The same principle is applied to the right side of the vehicle.

CONCLUSION

The fabrication of a 360° wheel rotation vehicle using a DC motor and chain mechanism is an innovative approach to address the issue of turning time in traditional vehicles. By utilizing a sprocket, DC motor, bearing, and chain drive, this vehicle can move in all directions from the same position. The use of the chain mechanism allows for smooth and efficient movement in any direction, which can be particularly useful in tight spaces where turning radius is limited.

The DC motor plays a critical role in powering the chain mechanism, which ultimately drives the wheels. Its efficient design and ability to produce high torque make it an ideal choice for this application. The sprocket and bearing help to ensure that the chain mechanism operates smoothly and with minimal resistance, while the wheels are designed to provide excellent traction and stability.

RESULT

The result of the fabrication of a360° rotating wheel for the purpose of improving parking areas is a mechanism that allows vehicles to be constantly in motion while occupying the same amount

of space as shown in Figure 6. By using a chain mechanism and Dc motors controlled by a DPDT switch the wheels of the vehicle can rotate in any direction enabling it to move forward backward and sideways with ease. This can help to reduce the problem of limited parking space in crowded areas and improve overall efficiency and convenience for drivers. The fabrication process required careful attention to detail and precision to ensure that the mechanism was sturdy reliable and safe to use. Overall, the result is a promising solution to a major societal problem that could have a significant impact on the daily lives of many people.

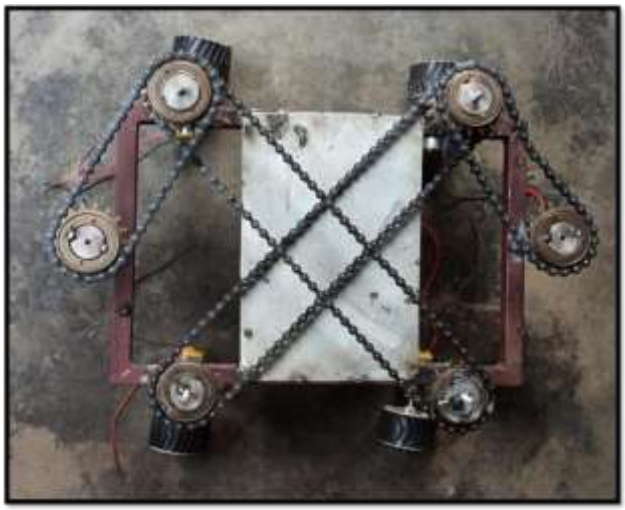

Fig 6: 360 ° rotating four wheel vehicle

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