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Motorized Petrol Bicycle

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Abstract

The growing demand for sustainable urban transport solutions has fueled interest in alternative modes of commuting. This study focuses on the development and optimization of a motorized gasoline bicycle, combining the efficiency and environmental friendliness of cycling with the comfort and extended range offered by a gasoline engine. The motorized petrol bike is designed to meet the challenges of urban commuting and is an alternative to traditional petrol powered vehicles. The integration of a compact and efficient gasoline engine with a conventional bicycle frame aims to increase the bicycle's range and allow users to cover longer distances without compromising environmental sustainability.

Key aspects of this study include the selection and integration of a suitable gasoline engine, the development of a reliable hybrid propulsion system, and the optimization of the overall design for efficiency and user-friendliness. In addition, emission control mechanisms are considered to minimize environmental impact. Performance testing and optimization is carried out to ensure that the motorized petrol bike meets safety standards, emission regulations and user expectations. The study also examines the economic feasibility and potential impact on urban mobility models. The findings of this research contribute to the ongoing discussion of sustainable transport options and offer insight into the practicality and performance of motorized petrol bikes as a viable means of urban commuting. This work aims to stimulate further research and development in the area of alternative transport and to promote a more sustainable and ecological urban mobility environment.

Key words: Mopeds, I.C Engines, Bicycle, Transportation, Motorcycle.

1.0 Introduction

A motorized bicycle is a bicycle with an attached engine or engine and transmission that is used either to propel the vehicle without assistance or to assist pedaling. Since it sometimes retains both pedals and a separate attached drive for rider-driven propulsion, a motorized bicycle is technically a real bicycle, albeit with a booster. They are typically unable to reach speeds above 52 km/h (32 mph), however, in recent years larger motors have been produced that allow the bikes to reach speeds of up to 72 km/h (45 mph).

The earliest motorized bicycles were ordinary utility bicycles equipped with an additional motor and transmission to assist normal pedal propulsion, and it is this form that fundamentally distinguishes a motorized bicycle from a moped or motorcycle. At a time when gasoline engine and transmission designs were in their infancy and power-to-weight ratios were low, a dual-purpose propulsion system seemed particularly advantageous. As time went on, the pedal drive was increasingly replaced by the constant use of a two- or four-stroke gasoline engine. However, the concept of using a motor assist for a regular bicycle has persisted, and the concept has periodically resurfaced over the years, especially during times of austerity or fuel shortages.[9]

In the UK, petrol bikes, also known as motorized bikes or mopeds, have special regulations regarding their use. Generally speaking, these vehicles must meet certain requirements to be considered road legal.

The term motorized bicycle refers only to a bicycle combining pedal power and internal combustion engine power. However, the term could be used as an umbrella category to refer to bicycles using sources other than pedal power. E-bikes could technically fall under the category of motorized bicycles, but instead of using internal combustion engines as a combination, they are powered by electric motors that power the pedals and batteries. Mopeds are also almost motorized bikes, as they function in the same way as these vehicles, but with engines smaller than 50 cc (3.1 cu in).[2]

The term motorized bicycle should not be confused with a motorcycle, as this type of vehicle uses a combination of pedal

power and engine power, while motorcycles are powered purely by either an internal combustion engine or an electric motor. Today, motorized bicycles continue to be developed both as complete designs and as add-on motor kits for use on standard bicycles, either by part-time hobbyists or commercial manufacturers. With the development of new, lighter and more powerful batteries, electric power assist motors are becoming increasingly popular, often using hub motors to facilitate aftermarket conversions. Converting bicycles or trikes has been shown to be helpful for some people with physical disabilities such as knee injuries or arthritis.[11] In 2003, the production of the French gasoline VELOSOLEX was discontinued in Hungary. However, production continues in China and has restarted in France. In the United States, Velosolex America sells VELOSOLEX worldwide. There are now several companies making internal combustion engine (ICE) conversion kits for conventional bicycles. These include the design of four-stroke and two-stroke gasoline engines. Among them, Golden Eagle Bike Engines currently produces a rear-engine (rack-mounted) kit using a belt to drivethe rear wheel. Staton-Inc., a long-time manufacturer of motorized bicycles, also uses a rack mount with a tire roller bearing (friction drive) or a chain driven gear drive. Other manufacturers make kits using small two- or four-stroke gas engines mounted in the middle of the bicycle frame and containing various types of gears and final drives driven by a belt or chain. Some of these brands include Jiangdu Flying Horse Gasoline Engine Factory Ltd., EZ Motorbike Company, Inc., Mega Motors Inc. and Grubee Inc.[7]

2.0 Literature Review

History of Motorized Gasoline Bicycles In the late 19th and early 20th centuries, inventors and engineers began experimenting with adding engines to bicycles to provide a source of electricity. Here's a quick look at some key events in the history of gasoline-powered bikes:

Early Experiments: In the late 19th century, bicycle enthusiasts and inventors became interested in the idea of adding motors to wheels to make vehicles faster and more comfortable.

Gottlieb Daimler and Wilhelm Maybach: In 1885, German engineers Gottlieb Daimler and Wilhelm Maybach developed a small internal combustion engine. The engine was mounted on a wooden wheel frame, making it one of the earliest motorized bicycles. This invention is often considered the birth of the motorcycle.

Hildebrand & Wolfmüller: In 1894, German inventors Heinrich Hildebrand and Alois Wolfmüller created the first commercially available motorcycle. It is powered by a two-cylinder, four-stroke engine and has a wooden frame.

20th Century: At the beginning of the 20th century, various types of motorcycles began to appear in Europe and the United States. These early motorcycles often have small engines and are used for transportation and sports.

Harley-Davidson: In 1903, William S. Harley and Arthur Davidson founded Harley-Davidson in the United States. Their company became one of the finest motorcycle manufacturers, producing strong and reliable engines, contributing to the popularity of motorcycles.

Indian Motors: In 1901, the Indian Motor Company was established in the United States. They are a major competitor to Harley-Davidson and produce motorcycles with various engine sizes.

Mass Production: Advances in manufacturing techniques and assembly line manufacturing in the early 20th century made motorcycles more accessible to the masses.

Evolution and Modernization: Over the decades, motorcycles have evolved significantly in terms of design, technology and performance. It has become a form of personal transportation, a recreational vehicle, and a symbol of freedom and rebellion.

Gasoline motorcycles form the foundation of the modern motorcycle industry, which continues to evolve today, offering a variety of styles and models to suit different tastes and needs.

3. Scope of Project

3.1 Problem Definition:

The problem definition for motorized gasoline bicycles outlines specific problems, challenges, or areas of concernrelated to these vehicles. It provides a clear understanding of what aspects require attention or investigation. Here is the problem definition for motorized gasoline bikes:The use of motorized gasoline bicycles, which combine traditional cycling with internal combustion engine technology, presents several notable challenges and issues: Environmental impact: Invest in cleaner engine technology, explore alternative fuels and enforce emission standards. Safety: Support driver education, mandate safety equipment and develop advanced safety features in vehicles. Regulatory Ambiguity: Standardize regulations and create clear guidelines for registration, licensing and safety requirements. Market Growth: Conduct market research, offer incentives andraise awareness of the benefits of motorized gasoline bikes.Engine efficiency and emissions reduction: Research and development of more efficient engines while enforcing emission standards. Infrastructure and Accessibility: Create refueling and maintenance infrastructure for convenience and environmental friendliness. Cost Effectiveness: Provide cost-benefit analyzes and financial incentives for users. DIY and Safety: Set DIY safety guidelines and educate the DIY community.[5]

3.2 Objectives of the Project

Riding up steep hills

Saving money on your commute by not driving or taking public transportation

Helping save energy when you need to travel long distances

Cutting through rush hour traffic and congestion

3.3 Scope of Project

The range of motorized petrol bikes is to provide affordable and efficient transport solutions, especially in areas where conventional vehicles may be less available or practical. They offer comfort, cost-effectiveness and flexibility for short to medium distance travel, making them popular for commuting, recreational rides and local errands. However, their scope may be limited by environmental concerns, regulations and evolving preferences towards electric vehicles and alternative fuels.

4.0 Methodology

4.1 Methodology

The design of a motorized gasoline bicycle requires a systematic methodology to ensure safety, efficiency and functionality. Initially, the design phase involves establishing specifications and requirements, including engine displacement, frame construction, and fuel tank location. Furthermore, prototyping and testing are necessary to verify the feasibility and performance of the design under various conditions. This includes integrating the motor with the bicycle frame, ensuring proper alignment and stability. In addition, safety features such as brakes, lights and throttle controls must be incorporated and rigorously tested. Finally, continuous improvement and optimization are essential to increase the motorcycle's reliability, fuel economy and overall user experience. During the entire process, it is necessary to comply with the relevant regulations and standards so that the motorized gasoline bike meets the legal and safety requirements.

4.2 Assumptions

For a motorized gasoline bike, some common assumptions may include:

Combustion engine: The bike is equipped with a small combustion engine powered by petrol.

Two-wheel design: It has a traditional bicycle frame with two wheels.

Motor Assist: The motor provides additional power to assist the rider when pedaling.

Limited range: Due to the small size of the engine and the fuel tank, the range of the bicycle on a tank of petrol is limited.

Speed limit: A bicycle is expected to reach a moderate speed, usually below speed limits for motor vehicles.

Minimal environmental impact: Since it runs on gasoline, it is believed to have a negative impact on the environment compared to electric or human- powered bikes.

Maintenance Requirements: Regular maintenance of the engine, fuel system and other mechanical components is essential for optimal performance.

Legal Aspects: The use of motorized gasoline bicycles may be subject to regulations regarding licensing, registration and use on public roads.

4.3 Assumptions for Design

Assumptions for designing a motorized gasoline bike usually include:

Engine Compatibility: Provided the bicycle frame can accommodate an engine, usually a small gasoline engine.

Fuel system integration: Provided that the bicycle has a fuel tank and fuel delivery system. **Transmission Adaptation:** The integration of a transmission system that can effectively transmit power from the engine to the bicycle wheels is assumed.

Structural Integrity: Provided the bicycle frame is strong enough to handle the added weight and stress of the engine and fuel system.

Legal and Safety Compliance: Provided compliance with local motor vehicle regulations and ensuring integration of safety features such as brakes and lights.

User Experience Consideration: Considering the user comfort, ease of operation and maintenance of the motorized bicycle.

4.4 Existing Technology

Current technology for motorized gasoline bikes includes various components and systems aimed at increasing performance, efficiency and user experience. These technologies typically include:

Engine systems: Motorized gasoline bicycles are equipped with small internal combustion engines designed for bicycles. These engines often range from 49cc to 80cc and are typically two-stroke engines due to their simplicity and compactness. Manufacturers are constantly improving these engines for better performance, fuel efficiency and reduced emissions.

Fuel Delivery Systems: These systems ensure proper fuel delivery to the engine for combustion. They consist of fuel tanks, fuel lines, carburetors and fuel filters. Advanced systems may include fuel injection technology for better fuel utilization and combustion control.

Ignition Systems: Ignition systems are critical to starting and running an engine. Traditional systems use magneto or CDI (Capacitor Discharge Ignition) systems to generate the spark necessary for

combustion. CDI systems are preferred for their reliability and efficiency.

Gear and clutch systems: Motorized bicycles are equipped with manual or automatic clutch systems to engage and disengage the engine from the drive train. Some models offer multi-speed transmissions for better acceleration and cruising capabilities.

Exhaust Systems: Exhaust systems remove exhaust fumes from the engine while minimizing noise and emissions. They often contain mufflers and catalytic converters to reduce noise and pollutants.

Frame and Suspension: The bicycle frame and suspension are designed to accommodate the added weight and power of the engine. Frames are usually braced to handle the stresses of the engine and transmission components.

Brake Systems: Braking systems are necessary to ensure the safety of the rider. Motorized bicycles use traditional bicycle brakes, such as rim brakes or disc brakes, which can be upgraded for better stopping power and durability.

Accessory components: These include electrical systems for lighting, instrumentation and accessories such as horns and turn signals. In addition, some models may include features such as electric starters for convenience.

4.5 Methodology Chart

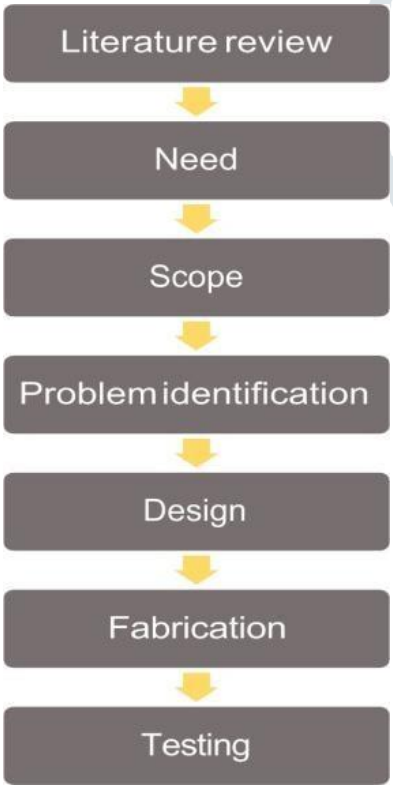

Fig.1

5.0 Details of Design , Working and Process

5.1 Design

A motorized bicycle is a bicycle with an attached engine or engine and transmission that is used either to propel the vehicle without assistance or to assist pedaling. The earliest motorized bicycles were ordinary utility bicycles equipped with an additional motor and gearbox to assist with normal pedaling.

Most motorized bicycles are based on or derived from standard general purpose bicycle frame designs and technologies, although there are many exceptions.

Motorized bicycles used all kinds of engines, from two-stroke and four-stroke internal combustion (IC) gasoline engines to electric, diesel, or even steam propulsion.

Designing a motorized bicycle requires a thorough understanding of the bicycle frame and the motor that will be used. The frame should be strong enough to support the weight of the motor and the rider, and the motor should be powerful enough to propel the bike at the desired speed. The fuel tank, exhaust system, and transmission system must also be considered in the design.[3]

If you are interested in designing a motorized bicycle, you may want to consider the following steps:

1. Determine the type of motor you want to use.
2. Choose a suitable bicycle frame.
3. Design the fuel tank, exhaust system and transmission system.
4. Assemble the motor and bicycle frame.
5. Test ride the motorized bike to make sure it is safe and functional.

5.2 Working

A gasoline bicycle is a type of motorized bicycle that uses a gasoline engine to power the engine. The motoris usually mounted on the frame of the bike and connected to the rear wheel by a chain or belt drive. The engine is started by pedaling the bike and then engaging the engine using the clutch or throttle.[1]The fuel injection system of gasoline bicycles is similar to that of automobiles. It consists of fuel injectors and

a fuel pump. When you turn the throttle on the bike, the pump is activated, which then transfers the fuel to the injectors.[3]

Injectors then inject fuel into the combustion chamber, where it is ignited by a spark plug. An engine contains a cylinder and a piston. When the air- fuel mixture ignites, it causes the piston to move, creating mechanical energy. The movement of the piston is transmitted to the crankshaft, which converts rectilinear movement into rotary movement.[7]

Many motorized bicycles use a centrifugal clutch. This type of clutch connects the motor to the drive train when a certain rpm is reached, allowing the bicycle to move without pedaling.[4] Engine power is transmitted to the rear wheel via a chain drive, similar to a traditional bicycle chain. The engine has an exhaust system that usually consists of an exhaust pipe and a muffler. This system removes the burnt gases produced during the combustion process.[2]

A throttle controller is usually mounted on the handlebars. When the rider turns the throttle, the valve in the carburetor opens, allowing more air and fuel to enter the engine, increasing the engine's RPM and consequently the bicycle's speed.[5] An ignition lock may be present to prevent unauthorized use of the motorized function. The motorized bicycle retains the original brake system of the traditional bicycle. This may include rim brakes, disc brakes or other braking mechanisms. Some motorized bikes have a switch that allows the rider to quickly turn off the engine in an emergency.

5.3 Construction

Engine:

Fig. 3

An engine is a machine designed to convert various forms of energy into mechanical energy. It typically involves burning fuel to produce motion or energy that can be used to power vehicles, machinery, orgenerate electricity. Engines come in a variety of types, including internal combustion engines, steam engines, and electric motors. They play a key role in powering modern transport and industry.[6]

Fuel tank:

Fig. 4

A fuel tank is a container that safely contains flammable liquids such as gasoline or diesel. Fuel tanks are typically part of the engine system in which fuel is stored and propelled or released into the engine. Fuel tanks come in a variety of sizes and complexities, from small plastic butane lighter tanks to multi-chamber cryogenic Space shuttle external tank.[2]

Exhaust system:

Fig.5

An exhaust system is a device that diverts reactive exhaust gases away from the controlled combustion inside the engine or stove. It includes one or more exhaust pipes and transports the burnt gases from the engine. The exhaust system collects, cleans and directs hazardous pollutants away from the occupants of the vehicle.[3]

Drive system:

Fig. 6

A chain drive system is a method of transferring mechanical power from one place to another. It is

widely used in vehicles such as bicycles and motorcycles to transmit power to the wheels. It isalso used in a wide variety of machines. Most commonly, power is transmitted by a roller chain,known as a drive chain or gear chain, passing over a gear, with the teeth of the gear meshing with holes in the chain links.[6]The gear turns and it pulls the chain introduces mechanical force into the system. Chains consist of a series of rigid links that are joined together by pin joints to provide the flexibility needed to wrap around the drive and driven wheels.[2]

Throttle:

Fig. 7

A throttle valve is a mechanism that regulates fluid flow through a constriction or obstruction. In internal internal combustion engine, the throttle valve is a means of controlling engine performance by regulating the amount of fuel or air entering the engine. The throttle body is part of the air intake system that controls the amount of air flowing into the engine's combustion chamber. A vehicle's engine power can be controlled by changing the engine's air- fuel ratio, which is done by squeezing the throttle.[9]

Clutch:

Fig.8

A clutch system is a mechanical device used in a vehicle's transmission system. Engages and disengages the transmission system from the engine.[1] When the clutch is engaged, the power is transferred from the engine to the drive wheels through the transmission system and the vehicle starts moving. The clutch is located between the engine flywheel and the gearbox. The main parts of the clutch are divided into three groups: driving members, driven members and control members.[8]

Carburetor:

Fig.9

A carburetor is a device used in gasoline internal combustion engines to control and mix the air and fuel entering the engine. It is responsible for supplying the gasoline engine with a mixture of fuel and air[5]. The carburetor works on the Bernoulli principle, which states that the static pressure of the intake air decreases at higher speeds, drawing more fuel into the air stream. The primary method of adding fuel to the intake air is via a venturi in the main metering circuit, although various other components are also used in some circumstances to provide additional fuel or air. Since the 1990s, carburetors have largely been replaced by fuel injection in cars and trucks, but carburetors are still used by some small engines (such as lawn mowers, generators, and concrete mixers) and motorcycles. Diesel engines have always used fuel injection instead of carburetors.[7]

5.4 Calculations

Power to weight ratio:

Power to weight ratio = Engine Power / Total Weight

Power to weight ratio = 6HP / 70 kg

= 0.085 HP/kg

Fuel consumption rate:

Fuel consumption = fuel consumption rate × driving time

Fuel consumption = 1.4 l/h

Range:
Range (in hours) = Fuel tank capacity / Fuel consumption rate (l/h)

= 3/1.4

= 2.14 l

Range (in kilometers) = range (in hours) × average speed (km/h)

= 2.14 × 50

= 107 km/l

Speed:
Assume a scenario where a GX160-powered vehicle travels a distance of 200 kilometers. If it took 4 hoursto travel this distance, we can calculate the average speed as follows:

Distance: 200 kilometers
Time: 4 hours

= DistanceTime

= 200
4

= 50 km/h

5.5 Advantages and Application

ADVANTAGES

- Cost effective transport
- Fuel efficiency
- Easy to use
- Parking and storage
- Versatility
- Independence

APPLICATION

- Commuting
- Scheduled transport
- Touring
- Towns and towns travel
- Campus transport
- Business and delivery services
- Alternatives to scooter and moped

6.0 Results

The motorized petrol bike represents a fusion of traditional cycling with modern technology, offering riders comfort and efficiency. With its compact dimensions and powerful engine, the petrol bike provides an affordable mode of transportation for short commutes and leisure rides. Its petrol-powered engine delivers smooth and reliable performance, allowing riders to cruise effortlessly through city streets and country roads. The motorized feature reduces the physical effort required to ride a bike and makes it accessible to a wider range of individuals, including those who may have limitations or prefer a less strenuous option. The gasoline bicycle embodies the balance between sustainability and practicality, offering an alternative mode of transportation that complements both personal and environmental needs.

7.0 Conclusion

In conclusion, the integration of motorized gasoline bicycles represents a significant advance in personal transportation, offering a combination of convenience, efficiency, and affordability. With their improved mobility and ease of use, motorized gasoline bikes provide users with a versatile option for navigating urban environments and exploring rural landscapes. Despite concerns about emissions and environmental impact, advances in engine technology and the introduction of cleaner fuels continue to improve the environmental friendliness of these vehicles. With increasing urban congestion and increasing environmental awareness, motorized gasoline bikes offer a viable solution for individuals looking for efficient and sustainable modes of transportation. Through further innovation and regulatory measures, these vehicles can continue to evolve as a practical and environmentally friendly alternative for modern transport needs.

8.0 Future Scope

The future of motorized gasoline bicycles looks promising as they combine the efficiency and comfort of traditional bicycles with the added power and range of gasoline engines. With the growing emphasis on sustainable transportation solutions and the need for eco-friendly alternatives to conventional vehicles, motorized gasoline bikes offer a compelling option for commuters and enthusiasts alike. These vehicles can bridge the gap between bicycles and motorcycles and provide users with an affordable and versatile means of transportation for short to medium distance travel. Additionally, advances in engine technology and materials can lead to more fuel-efficient and eco-friendly designs, further increasing the appeal of motorized gasoline bikes. Urban areas continue to struggle with traffic congestion and pollution, so these vehicles could prove to bea practical solution to reducing traffic congestion and reducing carbon emissions. In addition, the integration of smart features and connectivity options can improve the user experience and make motorized gasoline bikes even more attractive to consumers. All in all, the future of motorized petrol bikes looks bright as they offer a compelling combination of performance, efficiency and sustainability in the evolving urban mobility landscape.

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