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DESIGN OF HYBRID TWO WHEELER ELECTRIC VEHICLE

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ABSTRACT

In recent years, there has been a growing emphasis on sustainability and renewable energy sources in the transportation sector. One promising technology is the development of electric bikes (e-bikes) powered by solar energy. Our project focuses on the design and implementation of a Solar Electric Bike (SEB), combining the benefits of e-bikes with solar power to create a sustainable and eco-friendly mode of transportation. Utilizing photovoltaic panels installed on the bike's frame, we harness solar energy to charge the bike's battery, extending its range and reducing the reliance on grid electricity. The integration of efficient solar panels and a lightweight, aerodynamic design ensures optimal energy conversion and performance. Through innovative engineering and smart technology, our SEB offers an environmentally friendly alternative for urban commuting and recreational cycling. With zero emissions and minimal environmental impact, it represents a significant step towards a greener future in transportation. The integration of solar power into electric bicycles (e-bikes) represents a promising avenue for enhancing sustainable urban mobility. This abstract provides an overview of the technological framework and potential benefits of solar-powered –bikes. Solar panels integrated into the structure of e-bikes offer a renewable and clean energy source, reducing reliance on grid electricity and mitigating greenhouse gas emissions. The abstract discusses the design considerations, including the placement and efficiency of solar panels, battery capacity, and power management systems to optimize energy generation and utilization. Key benefits of solar-powered e-bikes include extended range and increased autonomy, enabling riders to travel longer distances without requiring frequent recharging. Additionally, solar charging infrastructure can be easily deployed, enhancing accessibility and convenience for users. Moreover, the abstract highlights the environmental advantages, such as reduced carbon footprint and air pollution, associated with solar-powered e-bikes compared to conventional fossil fuel-powered vehicles.

1.INTRODUCTION

Electric bikes (e-bikes) have gained significant traction globally, offering a sustainable and efficient alternative to conventional modes of transportation. They provide users with the convenience of motorized assistance while pedaling, thereby reducing the physical exertion required for commuting and leisure cycling. Furthermore, e-bikes contribute to lower carbon emissions, decreased traffic congestion, and improved air quality in urban areas.

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FIG 1: MODEL OF A SOLAR BIKE

Despite their numerous advantages, traditional e-bikes still rely predominantly on grid electricity for charging, which can limit their overall sustainability. This reliance raises concerns regarding the environmental impact of electricity generation and distribution, particularly in regions where fossil fuels dominate the energy mix. To address these challenges and further enhance the sustainability of e-bike technology, our project focuses on integrating solar power technology into e-bikes, resulting in the creation of Solar Electric Bikes (SEBs). By incorporating photovoltaic panels directly onto the bike's frame, we aim to harness clean, renewable energy from the sun and reduce the reliance on grid electricity for charging. The SEB concept builds upon the existing benefits of traditional e-bikes, such as pedal assistance for uphill climbs and extended range for longer journeys. However, by leveraging solar power, the SEB offers additional advantages that align with the growing emphasis on sustainability and renewable energy adoption.

Key points to consider regarding SEB's:

Maximizing Energy Efficiency: By integrating photovoltaic panels onto the bike's frame, the SEB aims to maximize energy capture from the sun while minimizing additional weight and aerodynamic drag. This design optimization ensures efficient energy conversion and utilization, thereby enhancing the overall performance of the bike

1. Reducing Carbon Footprint: The use of solar power for charging reduces the SEB's reliance on grid electricity, leading to lower carbon emissions associated with electricity generation. This reduction in environmental impact aligns with global efforts to mitigate climate change and transition towards cleaner energy sources.
2. Enhancing Sustainability: SEBs offer a sustainable mode of transportation by utilizing renewable energy from the sun. This not only reduces dependence on finite fossil fuel resources but also promotes energy independence and resilience in communities.
3. Promoting Accessibility: Solar-powered charging infrastructure can be easily deployed in various urban and rural settings, making SEBs accessible to a wide range of users. This accessibility contributes to the democratization of sustainable transportation options and promotes social equity.

2.COMPONENTS AND WORKING

The following are the various components which are used in manufacturing and design of a solar electric vehicle.

2.1 SOLAR PANEL

Solar panels work by harnessing the power of sunlight and converting it into usable electrical energy. The panels are made up of photovoltaic cells, which are typically made from silicon, when sunlight hits these cells, it excites the electrons within them, creating an electric current.

Fig 2: SOLAR PANEL

This current is then captured and can be used to [power various devices, such as solar bikes. The more sunlight the panels receive, the more energy they can generate. It's pretty amazing how sunlight can be transformed into clean and renewable energy.

2.2 BATTERY

The battery plays a crucial role. The solar panels on the bike generate electricity from sunlight, which is then stored in the battery. The battery acts as a power reserviour, storing the energy for later use.

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FIG 3: DC BATTERY

When you ride the bike, the motor draws power from the battery, providing assistance and making your ride easier. The battery also allows you to ride even when there's no direct sunlight, as it stores energy for cloudy days or nighttime. It's like having a backup power source that keeps you going on your solar-powered adventures.

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2.3 DC MOTOR

The DC motor in solar bikes is responsible for converting electrical energy from the battery into mechanical energy that powers the bike. It works by using the principle of electromagnetic induction.

FIG 4: DC MOTOR

When the electric current flows through the motor's coils, it creates a magnetic field. This magnetic field interacts with the permanent magnets inside the motor, causing the motor to rotate. As the motor rotates, it transfer the power to the bike's wheels, propelling you forward. It's a clever way to harness the energy stored in the battery and turn it into motion for a smooth and efficient ride.

2.4 CONTROLLR

The controllers on a solar bike plays a crucial role in managing the flow of electrical energy. They regulate the power coming from the solar panels and the battery, ensuring that the system operates efficiently.

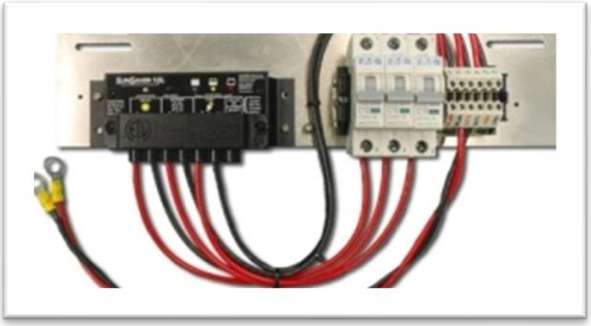

FIG 5: CONTROLLER

The controllers monitor the voltage and current levels, and they adjust the power output accordingly. They also protect the battery from overcharging and prevent any potential damage to the electrical components. Essentially, the controllers act as the brain of the solar bike, optimizing the energy flow and ensuring a smooth and reliable ride.

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2.5 CONVERTER

The converter in a solar bike is responsible for converting the DC power generated by the solar panels and stored in the battery into AC power that can be used to power the bike's motor. This conversion is necessary because most motors in electric bikes operate on AC power.

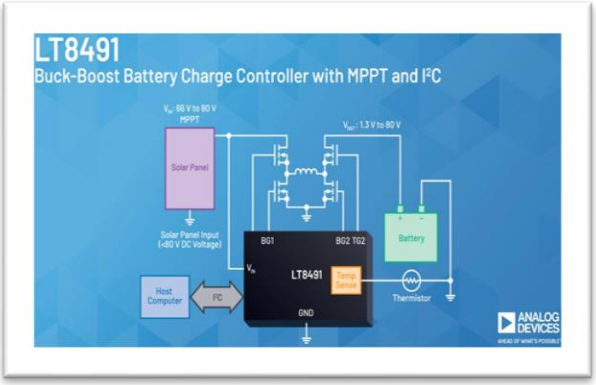

Fig 6: CONVERTER

The converter takes the DC power from the battery and converts it into the appropriate AC power to drive the motor, allowing you to enjoy a smooth and efficient ride on your solar bike. It's like a translator that helps the different components of the bike communicate with each other.

2.6 SPEEDOMETER

The speedometer on a bike measures the speed at which you're travelling. It works by utilizing a sensor that detects the rotation of the bike's wheels. As the wheels turn, the sensor sends signals to the speedometer, which then calculate the speed based on the frequency of those signals.

FIG 7: SPEEDOMETER

The speedometer displays the speed on a dial or digital screen, allowing you to keep track pf how fast you're going. It's a handy tool to have on your bike to help you stay aware of your speed and ride safety.

3.POBLEM FORMULATION

Despite the environmental benefits of electric bikes, their reliance on grid electricity for charging still contributes to carbon emissions and environmental degradation. Additionally, the limited range of e-bikes can be a barrier to adoption for longer commutes or recreational ride.

Our project aims to address these issues by developing a Solar Electric Bike (SEB) that utilizes solar power to charge its battery, reducing reliance on grid electricity and extending its range. By integrating photovoltaic panels directly onto the bike's frame, we aim to maximize energy efficiency and promote sustainable transportation solutions.

3.1 The main challenges we seek to tackle include: Environmental Impact: Minimizing the carbon footprint associated with electric bike usage by utilizing renewable solar energy for charging.

3.2 Range Limitations: Extending the range of electric bikes by supplementing grid charging with solar power, allowing for longer commutes and recreational rides.

3.3 Energy Efficiency: Maximizing the efficiency of solar panels and energy conversion systems to ensure optimal performance and minimal environmental impacts.

3.4 Cost-effectiveness: Developing a cost-effective solution that makes solar electric bikes accessible to a wide range of users, promoting adoption and sustainability.

3.5 Technological Integration: Integrating solar panels seamlessly into the design of electric bikes poses technical challenges related to weight, aerodynamics, and durability. Our project focuses on overcoming these challenges

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by optimizing the placement and design of solar panels to ensure they do not compromise the performance or aesthetics of the bike.

3.6 Charging Infrastructure: Establishing a robust solar charging infrastructure is essential for widespread adoption of solar electric bikes. This involves designing efficient and user-friendly charging stations that can accommodate multiple bikes simultaneously while ensuring reliable and rapid charging.

3.7 Battery Technology: Enhancing the energy storage capacity and efficiency of batteries is crucial for maximizing the benefits of solar electric bikes. Our project explores advancements in battery technology, such as higher energy density and faster charging capabilities, to improve the overall performance and user experience of the bikes.

Our project aims to overcome these challenges through innovative design, engineering, and integration of solar power technology into electric bikes, paving the way for a more sustainable and eco-friendly future in transportation.

4.RESULTS AND DISCUSSIONS

The implementation and testing of our Solar Electric Bike (SEB) have yielded promising results, demonstrating the feasibility and effectiveness of integrating solar power technology into electric bikes. The following outcomes and discussions highlight the key findings and implications of our project:

4.1 Enhanced Sustainability: By harnessing solar energy to charge the bike's battery, the SEB significantly reduces its environmental impact and carbon footprint compared to traditional electric bikes. The use of renewable energy sources promotes sustainability and contributes to mitigating climate change.

4.2 Extended Range: The integration of solar power technology extends the range of the SEB, allowing for longer commutes and recreational rides without the need for frequent recharging. This addresses one of the main limitations of electric bikes and enhances their practicality and usability.

4.3 Optimal Energy Conversion: Through innovative engineering and design, we have optimized the efficiency of the solar panels and energy conversion systems, ensuring maximum energy capture and utilization. This results in improved performance and reduced charging times for the SEB, enhancing user experience and satisfaction.

4.4 Cost-effectiveness: While the initial investment in a Solar Electric Bike(SEB) sustainability advantages further justify the may be higher than traditional electric bikes, the long-term cost savings from reduced grid electricity usage and maintenance make it a cost-effective option in the long run. Additionally, the environmental benefits and investment.

4.5 User Feedback: Initial feedback from users and testers has been positive, with praise for the extended range, environmental benefits, and overall performance of the SEB. Users appreciate the convenience and peace of mind of knowing they can rely on solar power for charging, even in areas with limited access to grid electricity.

Overall, the results and discussions highlight the significant potential of Solar Electric Bikes (SEBs) in promoting sustainable transportation solutions and reducing the pact of electric bike usage. By harnessing the power of the sun, SEBs offer a viable and eco-friendly alternative for urban commuting and recreational cycling, contributing to a greener and more sustainable future.

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5.CONCLUSIONS

In conclusion, our project demonstrates the feasibility and effectiveness of integrating solar power technology into electric bikes to create Solar Electric Bikes (SEBs). By harnessing renewable energy from the sun, SEBs offer a sustainable and eco-friendly mode of transportation that addresses the environmental challenges associated with traditional electric bikes.

Through innovative engineering, design, and optimization of solar panels and energy conversion systems, we have developed a cost-effective and efficient solution that extends the range and usability of electric bikes while minimizing their carbon footprint. The SEB represents a significant advancement in green transportation technology, offering users a practical and environmentally friendly alternative for urban commuting and recreational cycling.

Looking ahead, further research and development in solar electric bikes have the potential to revolutionize the transportation industry and promote sustainability on a global scale. By continuing to invest in renewable energy solutions and innovative technologies, we can create a more sustainable and resilient future for generations to come.

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