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Design and Fabrication of Treadmill on Wheels

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ABSTRACT :

This project introduces an innovative fusion of a treadmill and a bicycle, resulting in a mobile fitness device known as the "Treadmill on Wheels." Unlike traditional indoor treadmills, this system enables users to walk or jog while traveling outdoors. It operates using a brushless hub motor powered by a lithium-ion battery, offering a clean, emission-free mode of transportation. Designed using SOLIDWORKS and assembled with easily accessible components, the system promotes physical health while also contributing to reduced dependence on fossil fuels.

Keywords: Treadmill on Wheels, Eco-friendly mobility, Sustainable engineering, Fitness transportation, Zero-emission vehicle

INTRODUCTION

Treadmills are among the most popular exercise machines for home use, known for delivering a simple yet effective aerobic workout. Many individuals, especially those new to fitness or dealing with back problems, prefer treadmills due to the low-impact nature of walking. As users build strength and endurance, they can gradually transition to jogging or interval training on the same machine. Traditional treadmills are stationary, allowing users to walk or run in place. Historically , treadmills were not used for fitness but as manually powered devices. Before the advent of motorized equipment, they were driven by humans or animals walking on a rotating platform—often used to grind grain. In some cases, treadmills served as punishment tools for prisoners sentenced to hard labor. At that time, terms like "treadwheel" and "treadmill" were often used interchangeably. In modern times, treadmills have evolved into key fitness tools for walking, running, or jogging, especially for beginners. The concept of a treadmill bicycle extends this idea by enabling exercise while traveling. Since it is powered by a battery, it can also function as an electric bicycle, offering a smooth and enjoyable riding experience.

Problem Statement

The increasing reliance on motor vehicles has led to serious environmental concerns and a rise in inactive lifestyles. While stationary fitness equipment such as treadmills promote physical activity, they do not fulfill transportation needs. Moreover, these machines are typically bulky, fixed in place, and can become monotonous to use over time, resulting in decreased motivation. Therefore, there is a growing demand for a multifunctional solution that not only supports daily exercise but also offers an environmentally sustainable means of travel.

OBJECTIVES

The primary aim of the treadmill bicycle is to offer a novel and efficient mode of personal transportation. By integrating a DC motor for electric assistance, the system enhances the walking motion, allowing users to move at higher speeds with less physical effort—effectively making it easier than a casual walk in the park. This innovation addresses several current societal challenges. The growing reliance on fossil fuels has led to increased environmental pollution and depletion of natural resources. As the global population rises, so does the demand for fuel, intensifying the urgency to adopt sustainable transportation alternatives. This treadmill bicycle offers a clean, fuel-free solution that helps reduce carbon emissions and conserve energy. Moreover, in today's fast-paced lifestyle, individuals often struggle to maintain physical fitness due to time constraints. This product offers a practical solution by combining exercise and transportation. Unlike traditional treadmills confined to indoor use, this system allows users to exercise outdoors while commuting, promoting both health and sustainability. The project involved extensive research to understand the existing technologies and market trends. The core development phase focused on conceptualizing and engineering a feasible design. Key steps included concept generation, evaluation, and refinement using CAD tools. The process also required careful material selection, choosing suitable manufacturing techniques, and preparing detailed technical drawings for production. The culmination of the work was documented in a comprehensive report detailing the design and development journey.

METHODOLOGY

Conceptualization

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Design and Drawing

↓

Material and Fabrication

↓

Assembly and Integration

↓

User Experience

Conceptualization:

The treadmill bicycle is an innovative concept that blends the principles of treadmill exercise with the mobility of cycling. This hybrid system delivers a full-body cardiovascular workout while specifically strengthening the lower limbs. Its streamlined and efficient design makes daily fitness more accessible and engaging. By uniting the benefits of walking, jogging, and riding into a single device, it creates a practical solution for users seeking variety in their workout routines. This concept promotes overall wellness, offering a fresh and motivating approach to physical activity integrated into everyday life.

Design and Drawing:

The design of the treadmill bicycle emphasizes safety, strength, and comfort to ensure an optimal user experience. Built with a sturdy frame, it features adjustable handlebars and a seat to accommodate users of varying heights and preferences. The mechanism incorporates large wheels that rotate the treadmill belt as the user walks or jogs, effectively combining treadmill motion with cycling dynamics.
An intuitive control panel enables users to adjust speed settings and monitor workout metrics, allowing for a tailored exercise session. To enhance practicality, foldable components are integrated into the design, making the system space-efficient and easy to store—ideal for users in smaller living areas. Overall, the design successfully balances functionality with portability, offering a compact yet comprehensive fitness solution.

Fig.1: CAD Model

Material and Fabrication

Selecting the right materials and fabrication methods is crucial to developing a functional and durable treadmill bicycle. The frame is constructed using lightweight yet strong materials such as aluminum or mild steel, offering a balance between rigidity and ease of mobility. The treadmill belt is made from high-grade, non-slip rubber, ensuring user safety and long-term wear resistance. The rotating wheels, essential for smooth belt motion, are produced using reinforced plastics or lightweight metal alloys, which provide durability without adding unnecessary weight. User-focused components such as the seat and handlebars are designed to be adjustable, enhancing comfort and ergonomics. The control interface is made of impact-resistant plastic to ensure durability while maintaining a clean and intuitive design, reflecting an emphasis on both performance and user satisfaction.

Assembly and Integration

The assembly phase is key to transforming individual components into a cohesive and operational treadmill bicycle. This stage involves joining the main frame, correctly aligning and fastening the treadmill belt, and attaching the wheels to ensure proper movement. Precision is vital during this process

to maintain the system's structural integrity and mechanical efficiency. Additional features like braking systems and other safety components are installed to ensure secure usage. Once all components are assembled and aligned, the treadmill bicycle becomes a compact and practical fitness device, ready for use. This phase guarantees that each element works in harmony, providing a robust and dependable user experience.

User Experience

User testing is conducted to verify the treadmill bicycle's performance, safety, and comfort. The system is evaluated for proper alignment of parts, smoothness of operation, and ease of adjustment for
components such as the seat and handlebars. The control panel is tested for functionality, responsiveness, and user-friendliness, ensuring intuitive interaction. Material strength is assessed to confirm structural stability, and safety measures like emergency braking systems are rigorously checked. The treadmill bicycle undergoes real-world trials to evaluate comfort, maneuverability, and overall user satisfaction. These tests affirm its value as a reliable, innovative, and efficient solution for fitness and mobility.

COMPONENTS AND DESCRIPTION

The treadmill bicycle is composed of several key components, each contributing to its structure, performance, and user safety.

1. ***Main Frame***

The main frame serves as the foundational structure of the treadmill bicycle and is primarily fabricated using mild steel. This material is chosen for its favorable balance between strength and weight, allowing the frame to endure dynamic loads during operation while remaining manageable in terms of weight.
Designed to support essential components such as the treadmill belt, steering assembly, and handlebars, the frame ensures structural integrity and user safety. Its geometry is optimized for comfort and stability, enabling users to walk or jog without compromising balance.

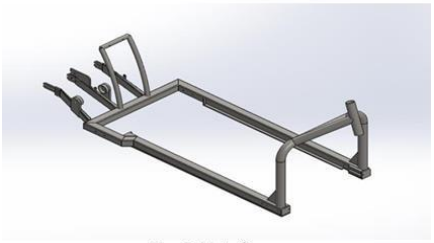

Fig.2: Frame

To ensure long-term durability and secure attachment of parts, advanced fabrication techniques such as welding and precision joining methods are employed. These processes help maintain the alignment and robustness of the frame, making it reliable for consistent use under varying conditions.

2. ***Conveyor Belt***

Fig.3: Belt

The conveyor belt is a critical component of the treadmill bicycle, constructed from durable rubber material. It is responsible for converting the user's walking or running motion into forward propulsion. Engineered to mimic the feel of running outdoors, the belt is designed to withstand continuous foot impact while providing a smooth, natural stride. Its robust construction ensures long-lasting performance
and reliability, even under regular use. The belt's consistent motion contributes to cardiovascular conditioning while also supporting a variety of workout styles, making it suitable for both light walking and intense running. Overall, the conveyor belt enhances the machine's utility as both a fitness tool and a mode of sustainable transport.

3. ***Rollers and Pillow Block***

Fig.4:Roller

Rollers and pillow blocks work in tandem to ensure the seamless functioning of the treadmill bicycle. The rollers, positioned beneath the conveyor belt, guide its motion and maintain consistent tension. These cylindrical components are essential for providing the necessary rotation that allows the belt to move smoothly as the user walks or runs. Pillow blocks, which house and support the roller shafts, play a critical role in minimizing friction during rotation. By reducing mechanical resistance, they enhance energy efficiency and contribute to a more natural walking experience. This setup not only ensures fluid belt movement but also protects the internal components from wear and tear. Together, the rollers and pillow blocks provide stability, enhance user comfort, and significantly extend the system's operational lifespan, making the treadmill bicycle a reliable and user-friendly fitness solution.

4. ***Gear Mechanism***

Fig.5: Gear

The gear mechanism in the treadmill bicycle plays a vital role in converting the user's motion into efficient mechanical output. This system consists of a large gear mounted on the rear wheel shaft and a smaller gear connected to the treadmill roller. With a gear ratio of 4:1, each rotation of the larger gear results in four rotations of the smaller gear, effectively increasing the speed of the treadmill belt.

This gear arrangement amplifies the user's walking or running effort, enabling the belt to move more rapidly while maintaining smooth and consistent motion. As the user walks, their energy is efficiently transmitted through the gears, resulting in a responsive and engaging cardiovascular workout.

The gear mechanism not only improves workout intensity but also enhances the overall performance of the treadmill bicycle by ensuring fluid belt rotation and efficient energy transfer.

5.3D MODEL

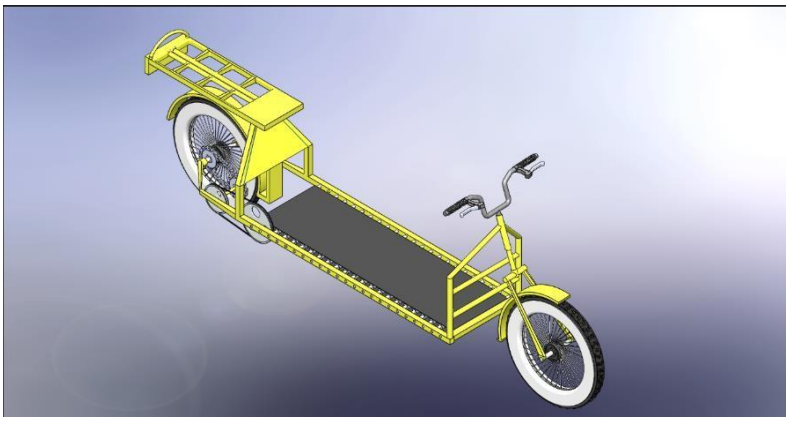

Fig.6: Assembled Treadmill Bicycle

Future Scope

The treadmill bicycle presents a novel and innovative way to integrate physical activity with eco- conscious transportation. By utilizing a gear-driven system along an inclined walking surface, the design enhances torque and converts walking motion into efficient forward propulsion. This setup not only promotes daily physical activity but also addresses prevalent health concerns such as obesity and respiratory issues .As an alternative to traditional fuel-powered transport, the treadmill bicycle is especially useful for short-distance travel and proves cost-effective in an era of rising fuel prices. Its suitability for users across all age groups further adds to its versatility and appeal. In the future, as fossil fuels continue to dwindle and environmental concerns escalate, the treadmill bicycle offers a promising, sustainable solution. Its potential to reduce air pollution while encouraging a healthier lifestyle positions it as a forward-thinking transport option that aligns with modern societal and ecological needs.

Conclusion

The treadmill bicycle serves as both a fitness device and a green mobility solution, enabling users to walk or run outdoors while reducing their carbon footprint. It operates without the need for fuel, making it a clean and sustainable mode of transport. Despite its simple mechanical concept, the design holds room for future improvements in terms of functionality, ergonomics, and efficiency. At its core, the project champions the use of renewable energy and promotes cardiovascular health through regular physical activity. By merging fitness with sustainability, the treadmill bicycle appeals to health- conscious individuals who are equally mindful of environmental responsibility, making it a practical and impactful innovation for the future.

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