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Coconut Tree Climbing Motorcycle

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Abstract : *The rising need for safer and more efficient coconut harvesting methods has led to the conceptualization of a revolutionary coconut tree-climbing motorcycle. This research aims to design and prototype a practical, affordable, and user-friendly climbing mechanism tailored to agricultural needs. The innovative design features a motorcycle-like single-frame structure powered by a lightweight 80cc two-stroke engine, chosen for its excellent power-to-weight ratio and cost-effectiveness. A robust three-roller system ensures stability, with two rubber-coated drive rollers providing superior grip and a Teflon-based support roller enhancing balance and maneuverability. The design is equipped with critical safety features, including disc brakes for emergency stops, engine braking for controlled descents, and landing legs engineered to absorb impact in case of system failure. Preliminary tests and simulations confirm the design's structural strength, gripping efficiency, and climbing capability, demonstrating its promise as a feasible solution for scaling coconut trees. While the prototype is still under construction, this innovative approach has the potential to significantly boost productivity, reduce labour dependency, and ensure safer operations in coconut harvesting.*

Keywords – *Climber, Tree Climber, Safety and Efficiency, Coconut Harvesting, Simple Design*

I. INTRODUCTION

In recent years, advancements in off-road exploration and innovative climbing technologies have inspired a ground-breaking concept: the development of a tree-climbing motorcycle. This ambitious endeavor seeks to design a specialized motorcycle capable of scaling tree trunks, traversing vertical surfaces, and maintaining stability in rugged, forested environments. By combining cutting-edge engineering with practical off-road solutions, the project aims to create a vehicle that safely and efficiently ascends trees, opening new possibilities for a variety of applications.

The envisioned tree-climbing motorcycle holds significant potential in fields such as forestry, ecological research, and adventure sports. In forestry, it could provide access to hard-to-reach areas for tasks like tree health assessments, canopy monitoring, and pruning. For ecologists, it offers a unique tool to conduct high-altitude research, enabling closer observation of flora, fauna, and ecosystems at various heights. Additionally, the motorcycle could revolutionize adventure sports, offering enthusiasts an exhilarating way to explore vertical forest landscapes.

To bring this vision to life, several engineering challenges must be addressed. These include designing an innovative wheel and grip system to securely attach the motorcycle to tree trunks, developing stabilization mechanisms for balance during climbs, and creating a lightweight yet robust frame capable of supporting the rider and necessary equipment. This project represents a bold intersection of creativity, engineering, and environmental exploration, paving the way for a novel approach to navigating the natural world.

II. LITRATURE SURVEY

Coconut tree-climbing cycles, also known as climbing devices or machines, are advanced tools designed to enable safer and more efficient scaling of tall coconut palms. Constructed with lightweight yet durable materials like Aluminum alloys or stainless steel, these devices are portable and robust, featuring adjustable hand grips and footrests for stability, anti-slip mechanisms for secure tree trunk adherence, and the ability to accommodate various tree sizes. Safety remains a primary focus, with modern designs incorporating full-body harnesses, instant-lock systems to prevent accidental slips, and ergonomic features to reduce strain during extended use. While

traditional manual models remain popular due to their affordability and simplicity, motorized versions powered by electricity or fuel have emerged, significantly reducing physical effort and improving efficiency, particularly in large-scale commercial operations. These devices are extensively used in agriculture for tasks such as harvesting coconuts, pruning, and applying pesticides or fertilizers, revolutionizing traditional methods of tree climbing.

The field of coconut tree-climbing robotics has seen remarkable progress, with several prototypes showcasing innovative approaches to automating climbing and harvesting processes. One such design, the A.R.C.H (Ark) robot, operates via remote control and is specifically engineered to climb poles of varying diameters. It features a manipulator equipped with two modular end effectors mounted on robotic arms with three degrees of freedom, enabling precise and efficient coconut harvesting (Anoop Abraham et al., 2014).

Similarly, a coconut harvesting machine developed by A.P. Mohanraj et al. (2014) is designed to accommodate the diverse shapes and sizes of coconut trees. Controlled by an RF remote, the machine incorporates a robotic arm capable of cutting coconuts with exceptional precision. It also allows for manual operation, providing flexibility to adapt to specific needs.

Another innovative solution is a fully automated tree-climbing robot that eliminates the need for human presence on the tree, addressing safety concerns and reducing labour costs. This device uses a triangular frame with a movable third side and spring-loaded mechanisms to adjust to varying tree diameters. Three wheels, each powered by high-torque DC motors, enable climbing, while a rotary blade arm attached to the robot is used for harvesting. A rechargeable battery powers the robot, and control is facilitated through RF transmitter/receiver units (Mani A. et al., 2014).

A simple and user-friendly motorcycle designed for tree climbing and product harvesting incorporates an efficient climbing mechanism. It features a single-frame body similar to a conventional motorcycle, with two strategically positioned rubber-coated rollers that provide stability and enable vertical movement. The vehicle is powered by an 80cc engine, chosen over an electric motor due to its lower cost, lighter weight, and reduced maintenance requirements. A belt drive system transfers power from the engine to the rollers, ensuring smooth operation. This motorcycle is designed to be easy to ride, maintain, and affordable, making it an ideal solution for farmers seeking a cost-effective and practical harvesting tool.

III. METHODOLOGY

The coconut tree climber is a uniquely designed machine crafted to combine safety, efficiency, and ease of use for harvesting tasks. Its robust single-frame body integrates an advanced climbing mechanism powered by a reliable 80cc M80 (2-stroke) engine, specifically chosen for its exceptional power-to-weight ratio and ability to deliver rapid climbing performance. This engine transfers power through a drive engagement system to two main drive rollers, which are coated with high-grip rubber to ensure a secure hold on the tree trunk. Complementing these is a third roller, serving as a support and landing component, constructed from durable Teflon material to withstand wear and provide added stability.

Safety is a top priority in this design, with multiple mechanisms in place to protect the operator. The climber is equipped with a responsive disc brake system, ensuring reliable stopping power during emergencies. In addition, a unique engine braking system controls the descent, offering a smooth and controlled return to the ground. As an extra layer of protection, specially designed landing legs are incorporated to absorb impact in the rare event of a brake or clutch failure, safeguarding the operator from potential harm.

Operating the machine is intuitive, resembling the control of a motorcycle but without the need for steering, allowing the operator to focus solely on the vertical ascent and descent. This design makes it both user-friendly and practical for farmers who may have limited experience with complex machinery. The simplicity of the controls, combined with the power of the engine, ensures that the climber can efficiently scale trees at a rapid pace, saving time and labour costs.

Built with affordability and durability in mind, this coconut tree climber is an invaluable tool for farmers. Its straightforward design minimizes maintenance requirements, and the use of widely available components keeps operational costs low. This machine not only enhances productivity but also prioritizes safety and ease of use, making it an ideal solution for modern agricultural needs.

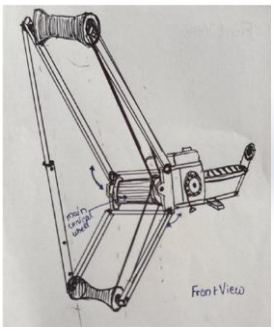
"The design and construction of the coconut tree-climbing motorcycle are ongoing. The assembly phase has not been completed at the time of this writing."

Main Roller: - this the main roller which is powered via V belts and pulley wheels the inner black layer is a grippy rubber layer which helps in climbing the tree with ease and doesn’t cause damage to the trees

Support Roller: - this support roller is the roller attached to the landing leg which is not powered but helps the bike stays in track with the tree being climbed
V belt pulley: - this is an ordinary v belt pulley wheel but with grooves in the middle of wheel for extra grip of belt on the pulley
Pedestal Bearing: - this type of bearing can hold a lot of torque applications and it's a fixed bearing
"V" belt: - we chose this belt because of its heavy grip and high torque applications and its efficiency

IV. FIGURES AND TABLES

Figure 1: Rough Sketch Figure 2: SolidWorks model



V. CONCLUSION

The Coconut Tree Climbing Motorcycle presents a simple and efficient solution to the challenges associated with tree climbing, making it an exciting and versatile addition to various industries and activities. This project aims to showcase the capabilities of our innovative tree climbing bike and demonstrate how it can be utilized for a wide range of practical applications. Coconut plucking is very laborious and difficult job. The tree climbing motorcycle is much easily controlled and operated, as it is manually controlled and will be adjusted to be adapted for the structure of each trees.

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Examples follow:

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