



Design and Development of An Automated Cloth Drying System with Wire Rope Pulley Mechanism

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ABSTRACT

In modern society, the increasingly hectic lifestyle leaves many individuals with limited time to manage household chores, such as drying clothes. To address this challenge, we propose an automated cloth drying system designed to enhance convenience and efficiency. This innovative system automatically retracts hanging clothes indoors when it detects rainfall and extends them outdoors when sunlight is detected, thereby optimizing the drying process without requiring manual intervention. The core functionality of the system revolves around an integrated weather detection mechanism, consisting of sensors that monitor rain and sunlight. When rain is detected, a signal is sent to the control unit, which activates a power window motor to retract the clothesline, ensuring that clothes remain dry. Conversely, when sunlight is detected, the system extends the clothesline to allow natural drying, thus harnessing solar energy. The system also features a manual switch, enabling users to override automatic controls and manually adjust the position of the clothesline as needed. This dual functionality ensures flexibility and user control in various weather conditions. The power window motor, known for its reliability and robustness, converts electrical power into mechanical motion, facilitating smooth and efficient movement of the retractable system. The design is engineered to support up to 20 kg of wet clothes, accommodating typical household laundry loads.

1. INTRODUCTION

The precarious climate can be troublesome to some individuals to dry their clothes outdoor due to unlikely weather conditions such as rain. Most of the people who work and leave at a flat house worry about their clothes that have been dried outside. They have no time to keep clothes if raining. There are a lot of cloth dryer rack designs are available in the market. However, most of the designs have a large size and take a lot of space.

Some houses have a very small space. They have a lot of volume for drying clothes. So, they have a problem to buy the clothes dryer rack by the conditions of their home and bring in their clothes while raining. A product that consumes small space saves time and worry free to users about hanging clothes outdoors is needed.

Here, an automatic retractable cloth drying system, to lighten the issues in the laundry for household usage, is developed. The retractable clothes drying system can move automatically during rain to help

people when they hang clothes outdoors. The clothes drying rack can move forward and backward automatically using DC power window motors and a Two-Way switch as the main function to control components. The rack moves backward when raining or dark days. When the weather is getting dark, clotheslines will move to a place that is not exposed to rain you can control it Manually.

2. PROSPECTIVE APPLICATION

1. Residential Use Urban Apartments: The system is ideal for urban settings where space is limited. It can be installed on balconies or in small laundry rooms, providing an efficient drying solution without occupying much space.

2. Commercial Laundromats Energy Efficiency: Laundromats can benefit from the system's lower energy consumption, reducing operational costs and offering a more sustainable service.

3. Hospitality Industry Hotels and Resorts: The system can be used in hotels and resorts to provide guests with a quick and efficient way to dry their clothes, enhancing guest satisfaction.

4. Healthcare Facilities Hospitals and Clinics: The system can be used to dry linens and uniforms efficiently, maintaining hygiene standards and ensuring quick availability of essential items. **5. Educational Institutions Boarding Schools and Universities:** The system can be installed in dormitories and student housing to provide a convenient and efficient drying solution for students. **Daycare Centers:** Daycare centers can use the system to quickly dry children's clothes and bedding, ensuring cleanliness and comfort.

6. Sports Facilities Gyms and Fitness Centres: The system can be used to dry towels and sportswear quickly, ensuring they are ready for the next use.

7. Agricultural Sector Farmhouses and Rural Homes: In rural areas, where traditional drying methods are still prevalent, the system can provide a modern and efficient alternative.

8. Disaster Relief and Emergency Shelters Temporary Shelters: In emergency situations, such as natural disasters, the system can be used in temporary shelters to quickly dry clothes and bedding, providing essential services to displaced individuals.

9. Military and Défense Military Bases: The system can be used on military bases to provide efficient and reliable drying solutions for uniforms and gear, ensuring they are ready for use at all times. **Field Operations:** Portable versions of the system can be used in field operations to maintain cleanliness and readiness of clothing and equipment.

10. Industrial Applications Textile Industry: The system can be used in textile manufacturing to dry fabrics efficiently during production processes, maintaining quality and reducing processing time.

3 CHALLENGES AND FUTURE SCOPE

The future scope of study for a cloth drying project could involve several areas of research and development to improve efficiency, sustainability, and user experience. Here are some potential avenues for future exploration:

1. Energy Efficiency: Investigate alternative energy sources such as solar or wind power for powering cloth drying systems, reducing reliance on electricity and lowering carbon emissions.

2. Smart Drying Systems: Develop smart cloth drying systems equipped with sensors, actuators, and automated controls to optimize drying cycles based on factors like fabric type, humidity levels, and weather conditions.

3. Material Science: Research innovative materials with enhanced moisture-wicking properties and quick-drying capabilities to improve the efficiency of cloth drying and reduce drying times.

4. Space-saving Designs: Explore compact and collapsible designs for cloth drying racks or lines to maximize space utilization in small living spaces such as apartments or urban dwellings.

5. Environmental Impact: Assess the environmental footprint of cloth drying practices and explore eco-friendly alternatives such as air drying, heat pump drying, or recycled water systems.

6. User Behaviour Studies: Conduct surveys and behavioural studies to understand user preferences, challenges, and attitudes towards cloth drying methods, informing the design of more user-centric solutions.

7. Cost-effective Solutions: Develop cost-effective cloth drying solutions accessible to low-income households or communities lacking access to conventional drying infrastructure, promoting social equity and sustainability

CONCLUSION

The cloth drying project successfully identified an optimal method for drying clothes using a geared motor system. The detailed analysis considered drying time, energy consumption, fabric quality,

and mechanical capabilities, leading to several key findings: **Efficiency:** The geared motor system provides efficient drying within predictable timeframes, making it a reliable alternative to conventional dryers. **Energy Savings:** The system significantly reduces energy consumption, promoting an eco-friendly solution for households. **Fabric Care:** The gentle drying process preserves fabric quality, reducing the risk of damage commonly associated with traditional drying methods. **Mechanical Reliability:** The system's design and component selection ensure long-term reliability and consistent performance. **Noise Level:** The geared motor system operates quietly compared to traditional electric dryers. The motor and drum mechanism are designed to minimize noise, making the system suitable for use in residential areas without causing disturbances.

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