

MACHINE DESIGN PROJECT REPORT

ME 306

Title :- Manually operated eco friendly road and dust cleaning machine

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Abstract

This report presents the design and development of a manually operated ecofriendly road and floor dust cleaning machine aimed at providing a sustainable alternative to conventional electric cleaning systems. The machine utilizes a simple mechanical system with wheels, a brush, a chain drive, and a waste collection bin to clean roads and floors effectively without contributing to pollution. The project focuses on energy conservation, ease of use, and environmental sustainability. This report details the components,

working principle, design considerations, advantages, limitations, and potential applications of the machine.

1. Introduction :-

Cleaning roads and floors is an essential activity to maintain hygiene and ensure a healthy environment. Traditional cleaning methods often rely on electric motors, diesel engines, or robotic systems, which consume significant energy and contribute to environmental pollution. Moreover, such systems are often expensive to maintain and operate. The manually operated eco-friendly road and floor dust cleaning machine addresses these challenges by offering a sustainable, cost-effective, and user-friendly solution. This machine is designed to clean roads and floors using manual power, eliminating the need for electricity or fuel, thereby reducing the carbon footprint and promoting environmental conservation. The primary motivation behind this project is to develop a cleaning device that is affordable, easy to use, and environmentally friendly. By using a mechanical system driven by human effort, the machine ensures zero emissions while maintaining effective cleaning performance. The design incorporates a brush system that sweeps debris into a collector bin, making it suitable for small-scale cleaning tasks in urban and rural areas alike.

2. Objectives :-

The main objectives of this project are as follows:

- To design and develop a manually operated cleaning machine for roads and floors.
- To create an eco-friendly

alternative to conventional electric cleaning systems. 1 • To ensure the machine is user-friendly, cost-effective, and requires minimal maintenance. • To reduce pollution caused by traditional cleaning methods. • To promote energy conservation by eliminating the need for electricity or fuel.

3. Components of the Machine:-

The manually operated eco-friendly cleaning machine consists of the following components:

- **Wheels:** Four wheels (with green rims) provide mobility and support to the machine. Two larger wheels are connected to the chain drive system.
- **Frame:** The main structure that holds all components together, made of durable metal.
- **Collector Bin:** A metal bin attached to the frame to collect swept debris.
- **Sprockets and Chain:** A chain drive system connects the wheels to the brush, transferring motion.
- **Shaft:** Connects the wheels and ensures synchronized movement.
- **Handle:** An adjustable handle with three height settings for ergonomic operation.
- **Base Frame:** Supports the brush and collector bin.
- **Supporting Frame:** Provides additional structural stability.
- **Mounts and Joints:** Secure the components to the frame.
- **Screws and Bolts:** Fasten the components together.

- Brush: A cylindrical brush that sweeps debris into the collector bin.

4. Working Principle :-

The working principle of the machine is based on a simple mechanical system driven by manual force. When the operator pushes the machine using the handle, the wheels rotate. The wheels are connected to a chain drive system, which transfers the rotational motion to the brush via sprockets. The brush rotates in the opposite direction of the wheels, sweeping debris such as leaves, dust, and small particles into the collector bin. The bin can be detached to dispose of the collected waste at a designated location. The handle is adjustable to accommodate different user heights, ensuring ergonomic operation. The machine's design ensures that the cleaning process is efficient, requiring minimal effort from the operator while maximizing the collection of debris.

5. Design Considerations :-

The design of the machine focuses on simplicity, durability, and sustainability. Key design considerations include:

- Material Selection: The frame and collector bin are made of lightweight yet durable metal to ensure longevity and ease of handling.
- Ergonomics: The adjustable handle allows users of different heights to operate the machine comfortably.
- Efficiency: The chain drive system is optimized to ensure smooth transfer of motion from the wheels to the brush, maximizing cleaning efficiency.
- Sustainability: The machine operates without electricity or fuel, making it an eco-friendly solution.

Weight Distribution: The placement of wheels and the collector bin ensures balanced weight distribution, making the machine easy to maneuver.

6. Advantages:-

1. Eco-friendly: Doesn't use fuel or electricity.
2. Cost-effective: Constructed with widely accessible
3. User-friendly: Easy to use and keep up.
4. Portable: Small and manageable.
5. No Pollution: While in operation, there are no emissions.

7. Uses:-

1. cleaning alleys and small streets.
2. campus upkeep for universities and schools.
3. Cleaning campaigns in the community and municipality.
4. Cleaning of external premises in rural and urban households.

8. Restrictions:-

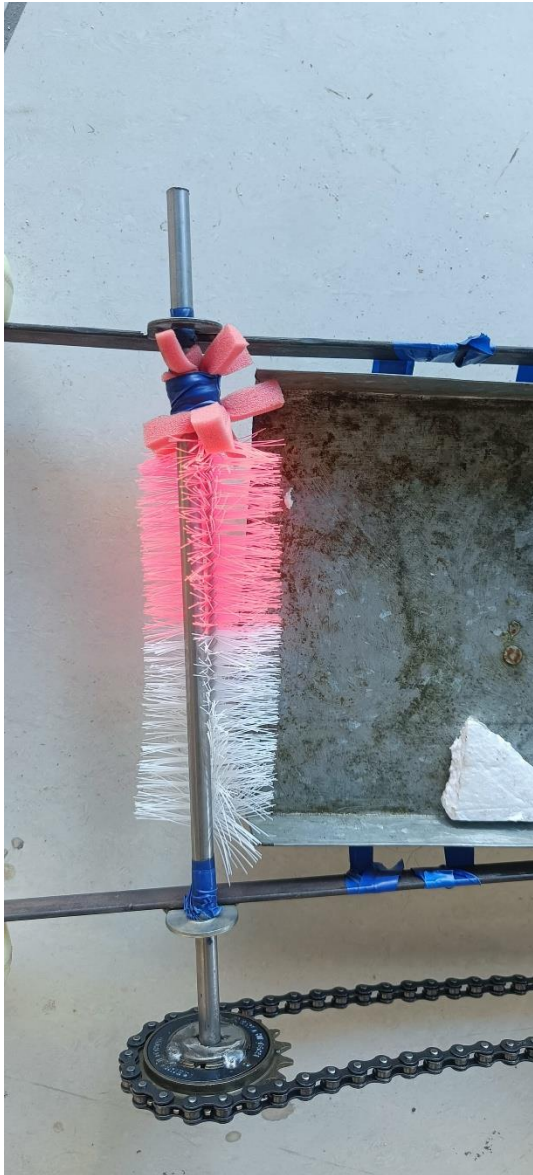
- 1.Large areas might not be appropriate for manual operation.
- 2.In dusty environments, the collector bin may need to be emptied more frequently.
- 3.Ineffective for sticky materials or wet waste.

9. Future Scope:-

- 1.Integration of solar-powered motor to assist manual operation.
- 2.Enhanced ergonomics and improved dust collection mechanism.
- 3.Development of interchangeable brush types for different cleaning surfaces.
- 4.Addition of water spray and suction functionality for wet cleaning.

10. conclusion:-

An environmentally friendly substitute for traditional cleaning equipment is the manually operated dust-cleaning machine for floors and roads. It is perfect for small-scale cleaning jobs in a variety of settings due to its straightforward design, minimal maintenance requirements, and energy-free operation. It is a promising solution for sustainable sanitation, and further advancements could increase its effectiveness and usability.



Brush part which used to sweep and keeps the waste bin



chain mechanism



