

Fabrication of Manual Operated Floor Cleaning Machine

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ABSTRACT:

In recent years, floor cleaning and fabrication of manually operated floor cleaning machine. The conventional floor cleaning and machines is most widely used in airport platforms, railway platforms, hospitals, bus stands, malls and in many other commercial places. These devices need an electrical energy for its operation not user friendly. In India, especially in summer, there is power crisis and most of the floor cleaning machine is not used effectively due to this problem, particularly in bus stands. Hence it is a need to develop low cost, user friendly floor cleaning machine. In this paper, an effort has been made to develop a manually operated floor cleaning machine so that it can be an alternative for conventional floor cleaning analysis of the floor cleaning machine was done using suitable commercially available software. The conventionally used materials were, considered for the components of floor cleaning machine.

Keywords: Floor cleaning machine, Design and Fabrication.

1. Introduction

Floor cleaning is an important activity to maintain hygiene and cleanliness in homes, hospitals, railway stations, shopping malls, and other public places. Traditionally, floors are cleaned manually using a broom or mop, which requires significant physical effort and consumes a lot of time. With the growth of large buildings and public spaces, manual cleaning methods are becoming inefficient and labor-intensive. Effective cleaning and sanitizing helps and protect the health of the human beings directly and indirectly. Also, cleaning and sanitizing prevents the pest infestations by reducing residues that can attract and support bees, pests etc. It also improves the self-life of the floor, walls etc. due to regular cleaning and maintenance. In recent years, most of the people prefer to use trains or buses for commuting and hence these places are littered with biscuits covers, cold drink bottles etc. Hence, it is

necessary to clean the bus stands and railways stations at regular interval. There is no one single cleaning method that is suitable cleaning technique and also the equipment should be user friendly. Cleaning work can be physically demanding and a need has been identified to developed methods for systematic ergonomics evaluation robots are getting more popular for busy and aging populations due to lack of workers. However in India, unemployment is more and hence there is a need to develop less labor oriented cleaning machine. Hence, the present work is aimed to design, development and evaluation of a manually operated floor cleaning machine. In recent years, conventional floor cleaning machines are most widely used in airports, railway stations, malls, hospitals and in many commercial places, as cleaning is one of the important parameter for the sanitation and government regulations. For maintaining such places, cleaning the floor is the major task which is necessary

To overcome these problems, different types of floor cleaning machines have been developed. Most conventional floor cleaning machines operate using electrical power are expensive, making them difficult to use in areas with power shortages or limited financial resources. In many places, especially in developing regions, the availability of electricity can be inconsistent, which limits the use of electrically operated cleaning equipment.

The manually operated floor cleaning machine is designed as a simple, low-cost, and eco-friendly alternative. This machine works by converting the forward motion of the wheels into rotational motion of cleaning brushes using mechanisms such as chains, gears, or shafts. When the machine is pushed forward, the rotating brush scrubs the floor and removes dust and dirt effectively.

The main aim of this paper is to develop a portable floor cleaning machine that reduces human effort, cleaning time, and operational cost. The machine can perform both dry and wet cleaning and can be easily

used in various places such as homes, hospitals, schools, airports, and commercial buildings. It is simple in design, easy to operate, and requires very little maintenance, making it a practical solution for everyday floor cleaning needs.

2. Literature review

The development of floor cleaning machines has attracted significant research attention due to the increasing demand for efficient, cost-effective, and user-friendly cleaning solutions. Existing studies primarily focus on reducing human effort, improving cleaning performance, and designing machines suitable for both domestic and commercial applications. Ranjit Kumar [1] examined conventional electrically operated floor cleaning machines used in large public facilities such as airports and hospitals. The study identified a key limitation in their dependence on electrical power, particularly during outages, and proposed a manually operated alternative. Stress analysis confirmed that the designed components operated within safe limits. Meshram et al. [2] introduced a tricycle-based street cleaning mechanism aimed at rural applications. The system utilized mechanical transmission to drive the cleaning unit and demonstrated improved area coverage with reduced operator effort. Similarly, Bankar et al. [3] designed a machine incorporating rotating brushes and a water spraying mechanism, resulting in reduced cleaning time and labor. Patil and Bhosale [4] employed a chain and sprocket mechanism to drive brushes in a cost-effective design suitable for large floor areas. Kumar et al. [5] further enhanced functionality by integrating sweeping and mopping operations into a single unit, thereby improving operational efficiency. Sutar et al. [6] developed a push-operated cleaning machine with integrated brushing and mopping systems, demonstrating reduced human effort. Reddy and Kumar [7] proposed a multi-purpose machine utilizing gear and chain transmission, with additional focus on operator ergonomics. Shinde et al. [8] and Chavan et al. [9] also contributed designs that combined scrubbing and water spraying mechanisms while maintaining low cost and portability. Rao et al. [10] developed a machine capable of performing sweeping, scrubbing, and mopping simultaneously, significantly improving cleaning performance. Singh and Sharma [11] conducted a comparative analysis between manual and automated machines, concluding that although automated systems offer higher efficiency, manually operated machines remain more practical due to affordability and independence from electrical power.

Recent studies have focused on optimization, portability, and sustainability. Patel et al. [12] improved brush mechanisms and ergonomic design to reduce operator fatigue. Gupta and Verma [13] emphasized design optimization through material selection and component efficiency. Ramesh et al. [14] developed a compact and portable machine suitable for small-scale applications. In addition, several works have explored enhanced functionality and alternative energy sources. Manikanta et al. [15] and Mishra et al. [16] proposed machines capable of both wet and dry cleaning while maintaining low cost and simplicity. Divakar et al. [17] introduced a solar-powered multipurpose cleaning system, highlighting the integration of renewable energy. More recent contributions by Reddy et al. [18] and Achar et al. [19] focus on mechanically operated and semi-automatic machines designed for public and residential use, emphasizing cost-effectiveness, ease of maintenance, and improved hygiene.

From the above literature, it is clear that there is a need for a simple, low-cost, and manually operated floor cleaning machine that can perform efficient cleaning without requiring electrical power. Such a system can be useful in areas where electricity availability is limited and can significantly reduce the physical effort required for floor cleaning.

3. Methodology

Floor cleaning is achieved by different technique which might be of different kinds. Different types of floor need different type of treatment. The floor should be totally dry after the cleaning process. Otherwise it may result in hazard. On some floors sawdust is used to absorb all kind of liquids. This ensures that there will no need of preventing them from spill of the sawdust has to be swept and replaced every day. Household cleaning is a repetitive task carried out by number of people every day. Therefore cleaning machine is very much useful in cleaning floor in houses. Many of floor cleaning machines are available but this floor cleaner is very simple in a construction and very easy to operate, anyone can operate it, without any prior training of any sorts with safety. The time taken for cleaning is very less and cost is also very less. Our floor cleaner will save huge cost of labor in future. This machine mainly consists of water tank, mop. The whole assembly is mounted on a frame made up of mild steel as it is cheap and easily available.

The manually operated floor cleaning machine works based on a simple mechanical mechanism that converts manual force into rotational motion for cleaning. When the operator pushes the machine using the handle, the

wheels rotate and move the machine forward.

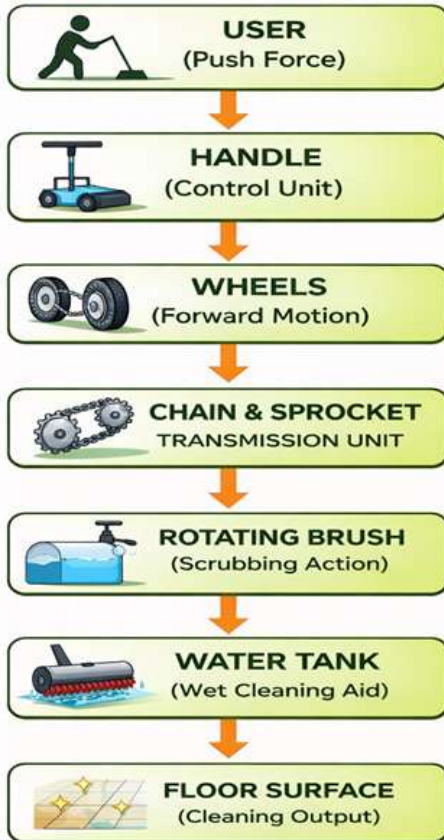


Fig.1: Block Diagram of Floor Cleaning Machine

The rotation of the wheels is transferred through a chain and sprocket mechanism to the rotating shaft connected to the cleaning brush. As the brush rotates, it scrubs the floor surface and removes dust, dirt, and stains. A water tank is provided to supply water during cleaning, which helps in loosening dirt and improving cleaning efficiency.

This mechanism allows the machine to perform both dry cleaning and wet cleaning without the need for electrical power.

3.1 components Description

The manually operated floor cleaning machine consists of several mechanical components that work together to perform the cleaning process. The main parts of the system include:

1. Frame

The frame is the main structural part of the machine that supports all other components. It is usually made of mild steel or iron to provide strength and durability.

2. Handle

The handle is used by the operator to push and control the machine. It is designed to provide comfortable grip and easy movement.



Fig.2: Handle of Floor Cleaning Machine

3. Wheels

Wheels are used to move the machine forward. When the wheels rotate, they transmit motion to the cleaning mechanism.



Fig.3: Wheel of Floor Cleaning Machine

4. Chain and Sprocket Mechanism

The chain and sprocket system transfers rotational motion from the wheels to the rotating brush. This mechanism ensures efficient power transmission.



Fig.4: Chain & Sprocket of Floor Cleaning Machine

5. Rotating Brush

The rotating brush is the main cleaning component. It rotates when the machine moves forward and removes dust, dirt, and stains from the floor surface.



Fig.5: Rotating Brush of Floor Cleaning Machine

6. Water Tank

The water tank stores water used for wet cleaning. Water is released onto the floor to assist the brush in removing dirt.



Fig.6: Water tank of Floor Cleaning Machine

7. Shaft and Bearings

The shaft connects the rotating components and helps transmit motion. Bearings are used to support the shaft and reduce friction during rotation.



Fig.7: Manual Operated Floor Cleaning Machine

4. Results and Discussion

After assembling the manually operated floor cleaning machine, several tests were conducted to evaluate its performance. The machine was able to clean both dry dust and wet dirt effectively. The rotating brush successfully removed dust, debris, and stains from the floor surface. The water tank assisted in loosening stubborn dirt during wet cleaning. The machine was found to be easy to operate and required less effort compared to traditional cleaning methods.

The results show that the manually operated floor cleaning machine can clean floors efficiently while

reducing cleaning time and physical effort.

5. Conclusion

The manually operated floor cleaning machine is designed and developed to provide an efficient and economical solution for cleaning floor surfaces. The machine works on a simple mechanical principle in which the forward motion of the wheels is converted into rotational motion of the cleaning brush through a chain and sprocket mechanism. This mechanism allows the brush to scrub the floor and remove dust, dirt, and stains effectively.

The cost of manufacturing the machine is low compared to electrically operated cleaning machines, making it affordable for small organizations and households. The results obtained from testing show that the machine is capable of performing both dry and wet cleaning effectively.

Overall, the manually operated floor cleaning machine provides a practical, eco-friendly, and cost-effective method for maintaining cleanliness in various environments. With further improvements in design and materials, the machine can be made more efficient and widely used in the future.

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