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MANUALLY OPERATED FLOOR CLEANING MACHINE

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ABSTRACT

A floor cleaning machine with motor drive is an advanced version of manual cleaning systems, designed to reduce human effort while increasing cleaning efficiency. This machine integrates an electric motor to drive the cleaning brushes or rollers, ensuring consistent scrubbing action on various floor surfaces. It includes components like a Motor, Brush assembly, Water tank, Battery and Wheels. The motorized mechanism enhances cleaning speed and performance, making it ideal for larger or more demanding areas such as hospitals, malls, and offices. This system combines the simplicity of manual machines with the efficiency of powered systems, providing a cost-effective and practical solution for modern floor maintenance.

KEYWORDS: Geared DC Motor, Water, Water Pump, Floor Cleaning Machine

I. INTRODUCTION

Both directly and indirectly, good cleaning and sanitization promote and safeguard human health. Additionally, by eliminating residues that may draw and sustain bees, vermin, etc., cleaning and sanitizing helps avoid pest infestations. Regular cleaning and upkeep also extends the life of the walls, floors, etc. These locations are cluttered with biscuit covers, cold drink bottles, and other items because most people now prefer to go by rail or bus. As a result, regular cleaning of the bus stops and train stations is required. There isn't a single cleaning procedure that works well, and the equipment needs to be easy to use.

There is a need to establish methodologies for systematic ergonomics evaluation because cleaning labor can be physically taxing. Due of a shortage of personnel, robots are becoming more and more appealing among busy and elderly populations. But because unemployment is higher in India, less labour-intensive cleaning equipment needs to be developed. Therefore, the goal of the current project is to design, build, and assess a floor cleaning equipment that is manually controlled. The most common locations for traditional floor cleaning machines in recent years have been airports, train stations, shopping centers, hospitals, and other commercial establishments.

since cleaning is a crucial component of government rules and sanitation. Cleaning the floor is the most important thing that needs to be done to preserve such spaces. The aforementioned locations have access to traditional floor cleaning equipment. Conventional floor cleaners typically need electricity to run. In most of India, there is a power crisis, particularly during the summer. Therefore, it is challenging to clean the floor with traditional floor cleaning equipment without power. The goal of this project is to create a manually driven floor cleaner that can serve as a backup for traditional floor cleaners in the event of a power outage.

For this age, cleaning is a basic necessity. Basically, because there are more people using these facilities—colleges,

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businesses, and hospitals—regular floor cleaning is necessary. The many kinds of surfaces are cleaned using different methods.

II. LITERATURE SURVEY

[1]M. Ranjit Kumar, et al. "Design and Analysis of Manually Operated Floor Cleaning Machine," International Journal of Engineering Research & Technology (IJERT), vol.4, no. 4, Apr. 2015. mentioned that floor cleaning machines that Work on electrical power are not user friendly. They have also mentioned that there is a power crisis in India during summer season. They identified that most of the electrically operated floor cleaning machines are not used effectively because of power crisis. They identified the need to create user friendly and low-cost floor cleaning machine, so they developed a manually operated floor cleaning machine as alternative to the electrically powered floor cleaning machine.

III. OBJECTIVES

1. To design and develop an automated system capable of continuously monitoring the power factor in real-time for electrical loads.
2. To implement IoT technology (using ESP32) for wireless transmission of power factor data to enable remote monitoring and control.
3. To accurately measure voltage and current using current transformers and voltage transformers for precise power factor calculation.
4. To automate the correction process by switching appropriate shunt capacitor banks via relay control, improving the power factor towards unity.
5. To reduce power losses and improve energy efficiency by maintaining an optimal power factor, thereby minimizing electricity costs and penalties.
6. To provide a local display unit (LCD) for real-time visualization of electrical parameters and system status.
7. To enhance system reliability and accuracy through proper power supply regulation, sensor calibration, and robust control algorithms.
8. To demonstrate the applicability of the system for industrial and commercial settings with varying inductive loads.

IV. METHODOLOGY

1. **Power Supply:** The power supply is the main input source of the system. It generally consists of AC mains supply (230V,50 Hz).

This AC supply is used only for charging the battery, not for directly running the motors.

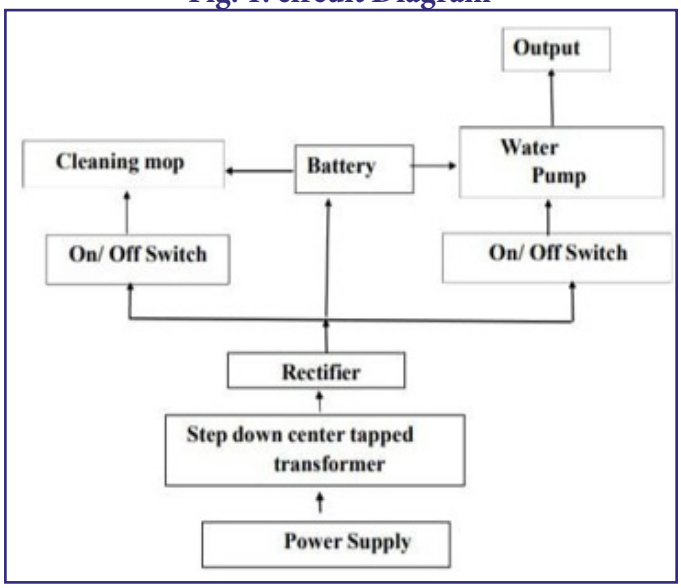
1. **Step-Down Center-Tapped Transformer:** The step-down center-tapped transformer performs two important functions: Steps down the high AC voltage (230 V) to a low AC voltage (for example, 12 V or 24 V). Provides electrical isolation between the mains supply and the low-voltage circuit, ensuring safety. The center tap allows easier rectification and balanced voltage output.
2. **Rectifier:** The rectifier converts the low-voltage AC from the transformer into DC voltage. Usually implemented using a full wave rectifier Converts AC to pulsating DC. This DC is suitable for charging the battery
3. **Battery:** Stores electrical energy in DC form Supplies power to Cleaning mop motor and Water pump motor. Enables portable and cordless operation. The battery is charged through the transformer and rectifier circuit.
4. **On–Off Switch (Cleaning Mop Section):** This switch controls the operation of the cleaning mop motor. When the switch is ON, power flows from the battery to the cleaning mop, When the switch is OFF, the mop stops working.
5. **Cleaning Mop:** The cleaning mop is the mechanical part used for scrubbing and cleaning the floor. Powered by the battery Converts electrical energy into rotational mechanical motion Removes dust, stains, and dirt from the floor surface
6. **On–Off Switch (Water Pump Section):** This switch independently controls the water pump motor. Allows separate operation of water spraying. Helps in controlling water usage and improves cleaning efficiency
7. **Water Pump Motor:** The water pump motor is responsible for spraying water or cleaning solution onto the floor.
8. **LED Indicator :** 5mm / 5V DCA visible indicator used to display system status or power availability.

WATERTANK: A water tank is a storage container

used to collect, hold, and supply water for domestic, industrial, and agricultural use. It is made from materials like plastic (HDPE), concrete, steel, or fiberglass.

Functions: Draws water from the tank and sprays water in front of the cleaning mop. Helps in removing tough stains and dirt

Fig. 1: circuit Diagram



The floor training robot is designed with a robot structure connected with wheel and there is a floor cleaning brush motor and water spraying pump and suitable rechargeable battery which provide a power supply to DC motor and pump. The pump and brush motors can be possible to operate using on off switches which are connected at handle of the robot.

The DC motor which is fitted to the robot at the downside and the cleaning brush or mop is connected to the shaft of the motor the water pump is used to spray the water towardsmopbrushandthismotoroperatesfrom5vpower supply which is connected from 7805 power supply circuit.

The battery used here is 12V lead acid battery which is rechargeable and provides the power to both DC motor and pump. The battery is possible to charge using step down transformer rectifier circuit and filter capacitor. The battery power is connected to DC motor and pump using switches and the corresponding LED indicates the status of motor and pump on condition.

The water pump operate with 5v power supply which 7805 power supply unit and the 5v is developed through 7805 regulator.

Result: The rotating cleaning The output of the battery-operated floor cleaning system is the effective and efficient cleaning of floor surfaces with minimal human effort. When the system is switched ON, the battery supplies power to the cleaning mop and water pump motor, producing the following results:

1. **Clean Floor Surface:** Mop removes dust, dirt, and stains from the floor, resulting in a visibly clean surface.
2. **Uniform Water Spraying:** The water pump motor sprays water or cleaning solution evenly on the floor, helping to loosen stubborn dirt and improve cleaning effectiveness.
3. **Reduced Manual Effort:** The system significantly reduces physical strain compared to conventional manual mopping methods.
4. **Time-Efficient Cleaning:** Faster cleaning operation is achieved due to continuous mop rotation and controlled water flow.
5. **Portable and Cordless Operation:** Since the system is battery-powered, it allows easy movement and cleaning without dependency on a direct AC supply.
6. **Improved Hygiene:** Effective removal of dirt and wet mopping helps maintain a hygienic and dust-free environment.

The battery-operated floor cleaning system was successfully designed, developed, and tested, meeting the objectives set at the beginning of the project. The system effectively integrates a charging unit, battery storage, cleaning mop, and water pump motor to provide efficient floor cleaning with minimal human effort.

The use of a step-down transformer and rectifier ensured safe and reliable battery charging, while the battery-powered operation enabled portability and cordless use. Independent ON–OFF switches provided better control over the cleaning mop and water pump, improving usability and energy efficiency.

V. FUTURESCOPE

1. **Hybrid Power and Automation:** Evolving from purely manual operation to semi- automatic sys-

tems with battery or solar power options to reduce human effort while remaining more affordable than fully robotic systems. This allows for a balance between labor reduction and cost.

2. **Multifunctional Cleaning:** Integrating mechanisms to perform multiple tasks in a single pass, such as simultaneous wet and dry cleaning, mopping, vacuuming, and even UV sterilization to improve hygiene and efficiency

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