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Fabrication of Solar Operated Multipurpose Floor Cleaning Machine

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Abstract

With the advancement of technology, automated floor cleaning machines are getting more attention of researchers to make life of mankind comfortable. The concept is developing in economic countries but the reasons for non-popularity is the design complexity, cost of machines, and operational charges in terms of power tariff. In this paper, a manual floor cleaning machine is proposed. In early day a floor is clean by using a broom which is operated by human hand, in this a continuous movement of human hand is required which create fatigue and time consuming. The aim of this work is to develop and modernized process for cleaning the floor with wet and dry. This machine is capable of performing cleaning of floor in dry as well as wet condition, and it also have storage box to store a dust. This floor cleaning machine is designed by keeping the basic considerations for machine and efforts reduction, environment friendly and easy handling. The machine will work on solar power and there is no need of training to operate it. This work can be very useful to improve the life style of mankind.

Keywords: Multi-Purpose Floor Cleaning, Solar Panel, Efficiency

INTRODUCTION

Cleaning is the essential need of the current generation. Basically in household the floor has to be cleaned regularly. This machine deals with designing and fabrication of floor cleaning machine. The main aim is that it combines operation of all three different device's operation i.e. vacuum cleaner, dryer & mop. For floor cleaning, many types of machines are available in the market are of high ranges and high weights. So, keeping the focus on weight as well as cost, they are not affordable to everyone. As many type of machines is widely used for this purpose. Hence, there is need to design and develop a floor cleaning machine which is multi use and cost effective. Considering weight criteria, machine assembly, handling the machine is very flexible. It is very simple in construction and easy to operate. Anybody can operate this machine easily. The size of the machine is also portable, so we can transfer from one place to other place very easily. This machine is applicable for various floor cleaning activities. Hence there is a need of bringing revolution in the area of

science and technologies, which could help easily in repetitive tasks which we perform daily. It also giving consideration to the intensity of labor required

OBJECTIVES

- 1. To achieve simultaneous dry and wet cleaning in a single run.
- 2. Lower Maintenance Cost and Time.
- 3. Required less cleaning time.
- 4. Clean more space in less time.

1.3 SOLAR ENERGY

The Solar energy is a renewable source of energy which is abundantly available, used for various purpose in form of solar water heater, solar power, and solar cooker. Solar energy is radiant light and heat from the sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis. It is an important source of renewable energy and its technologies are broadly characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy.

1.3.1 PASSIVE SOLAR ENERGY

The passive solar system does not involve mechanical devices or the use of conventional energy sources beyond that needed to regulate dampers and other controllers. The passive system is very convenient system and does not involve any complicated design, solar heater and flat solar panels are best example for this system.

1.3.2 ACTIVE SOLAR ENERGY

The active solar energy system involves external sources like motors and circuits to function the system accurately, the use of mechanical systems for system accuracy and efficiency increases this system is applied. This type of system requires complicated design structures and involve with combination of all engineering like electronics, mechanical, computer science.

1.3.3 SOLAR ENERGY SYSTEMS

In Recent years, many of residents around the world used electric solar system as a sub power at their houses. This is because solar energy is an unlimited energy resource, set to become increasingly important in the longer term, for providing electricity and heat energy to the user. Solar energy also has the potential to be the major energy supply in the future.

2.1 LITERATURE SURVEY

- **Himani Patel** in her research, she works on wireless multipurpose floor cleaning machine. She focused on the problems of long wires so to overcome this problem she use battery system which can be rechargeable when electricity is available and work as required.[1]
- **Arjun V Murali et al**. in their research, they work on floor cleaning machine. Their aim to develop and modernized process for cleaning the floor with wet and dry. At first dust is collected from vacuum cleaner. After that Water is sprayed from water tank and floor cleaning is done by rotating press which is coupled to the DC motor. Fan is used to dry the water which is fitted to the Back side of the vehicle.[2]
- **Mr. S. Rameshkumar et al.** in their research, they work on Design and fabrication of multipurpose floor cleaning machine. In their work, modeling and analysis of the floor cleaning machine was done using suitable commercially available software. From the finite element analysis, they observe that the stress level in the manually operated floor cleaning machine is within the safe limit.[3]
- **Samarth G. Giakwad et al.** in their research, they work on Design and development of multi-functional floor scrubber and cleaner. They focused on to design and develop a multifunctional floor scrubber and cleaner which will substantially reduce the cleaning time and cost of the machine. At the same time, the floor cleaning machine should be capable of cleaning rough as well as smooth floors and inaccessible corners effectively. Through efficient project management, aspects like minimization of manufacturing and operational cost, aesthetic and ergonomic considerations were taken into account. Eventually this machine will lead to hefty decrease in time, money and effort.[4]
- **Manya Jain et. al, [5]** discussed the event of Automatic Floor Cleaner. The project is often used for domestic and professional purpose to scrub the surface automatically and manually. When it's turned ON, it gulps within the dust particles by moving everywhere the surface (floor or the other area) because it moves over it. the driving force control mechanism are often wont to drive the motors where robot having the ability to manoeuvre and also the also few sensors are accustomed detect and avoid the obstacles. this can be often useful in making the approach to life better for humankind.
- **Abhishek Pandey et. al, [6]** reviewed the requirement of a residence Cleaning Automatic robot. For keeping time there's a requirement of programmed system that cleans alone without person interventions. Also, they considered how precisely to help those that have physical disabilities. Because that they had to induce this done, they needed a cleaning system that may add accordance from what we are saying, thus supporting a physically someone
- . **Karthick.T et. al, [7**] is intended to create up an autonomous automatic robot which will move itself without constant human instruction. The autonomous cleanser robot involves low power consuming electric components and it can operate at very low power. Electric parts are the controller board Atmega 2560, Ultrasonic detectors, transformer IC and motor driver circuit. Mechanized part is motor unit with gearbox founded. Ultrasonic detectors will identify obstructions in line with the program being executed. A 12V, 4.5Ah rechargeable lead acid electrical device is that the energy source for this proposed cleaning automatic robot.

- **Manreet Kaur and Preeti Abrol, [8] came** up with the working of automatic robot Floor cleaning. This automatic robot can add any of two methods. All hardware and software functions are handled by AT89S52 microcontroller. This automatic robot is in a position to perform sweeping and mopping job. RF modules is getting used for cordless communication between remote (manual method) and automatic robot has range of 50m. This robot is given with IR sensor for obstacle recognition and automates water sprayer pump. Four motors are being employed, two for cleaning purpose, one for pump and one for tires. Dual relay circuit is employed to work the motors one for the pump and another for the cleaner
- **Vadivel, et. al. [9]** developed a floor cleaning machine suitable for large floor which works based on the continuous relative motion between a scrubber and the floor surface. The machine has propulsion mechanism of driven wheels and guide wheels for tracking area on the floor to be cleaned. If the water is present, it will be detected and sucked by the vacuum pump followed by the scrubbing action is done by the scrubber which directs the towards rear end. The machine has a sweeper mechanism is mounted on the machine followed by propulsion mechanism.
- **Balasaheb Kasure, et. al. [10]** presented a Robot Based mechanism for cleaning between the railway track. The design is aimed to overcome all the disadvantages of the current machine to have super clean railway tracks. In this machine a vacuum technology has been used in which all types of waste material like, empty plastic water bottles, human waste, waste paper etc. will be collected. This machine suitable for all climatic conditions and can be attached to an existing compartment of train and this compartment can be made standalone and engineered low-cost communication techniques. It is also mentioned in the paper [10] that the developed machine is time saver, dirt destroyer, cost effective and eco-friendly as well.

1.1 FLOOR CLEANING

The treatment needed for different types of floors is very different. Slipping is a common safety hazard for cleaning methods that involve water or other liquids, especially if the floor is left wet.

Sawdust is used on some floors to absorb any liquids that fall rather than trying to prevent them being spilt. The sawdust is swept up and replaced each day. This was common in the past in pubs and is still used in some butchers and fishmongers. It used to be common to use tea leaves to collect dirt from carpets and remove ODOURS.

There are also a wide variety of floor cleaning machines available today such as floor buffers, automatic floor scrubbers and sweepers, and carpet extractors that can deep clean almost any type of hard floor or carpeted flooring surface in much less time than it would take using a traditional cleaning method.

WOOD FLOORING

Different types of wood flooring may require completely different care depending on whether they are waxed, oiled or have a polyurethane coating. It is important to determine the type of finish of a wood floor and always treat it in the proper manner, for instance it is difficult to clear wood floor wax from a floor coated with polyurethane. Simple cleaning instructions:

1. Clear the floor of any furniture that is easy to move.
2. Sweep or vacuum all loose dirt and debris.
3. Buff the floor with a soft cloth to remove any soapy residue. Cloth diapers work well for buffing since they are very soft and absorbent.

TILE & STONE

Tile and stone flooring is common in kitchens, stairs, and bathrooms. Its cleaning process can be divided into three steps:

1. Dirt or dust should first be removed with a vacuum cleaner or a broom.
2. Have a floor cleaning solution or spray bottle for the appropriate floor. If you are cleaning stone floors (marble, granite, travertine, etc.), make sure the cleaning agent states that it is for stones. An acidic tile cleaning solution can be used on ceramic and porcelain floors
3. After spraying the tile or stone floors in a small area, use a mop to clean and scrub floors. Then wipe it with dry cloth.

VINYL COMPOSITION TILE

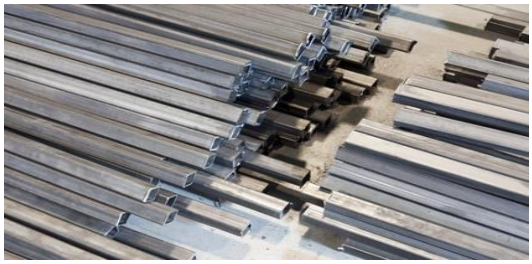
Vinyl composition tile or VCT is a common commercial floor type. Cleaning this type of floor is done with either a mop and bucket or with a floor scrubber.

VCT requires a polymer coating or floor finish to protect it. This needs to be kept clean with dust mopping and wet cleaning (i.e. wet mopping or floor scrubber).

CHAPTER 3
COMPONENTS

- SQUARE TUBE
- WATER SPRAYER
- BRUSH
- BATTERY
- MOTOR
- SOLAR PANEL

3.1 SQUARE TUBE



Square and rectangular tubing is also known as HSS (hollow structural steel). A hollow structural section (HSS) is a type of metal profile with a hollow cross section. The term is used predominantly in the United States, or other countries which follow US construction or engineering terminology.

3.2 SWITCH

In electrical engineering, a **switch** is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another.[1][2] The most common type of switch is an electromechanical device consisting of one or more sets of movable electrical contacts connected to external circuits. When a pair of contacts is touching current can pass between them, while when the contacts are separated no current can flow.

3.3 SOLAR PANEL

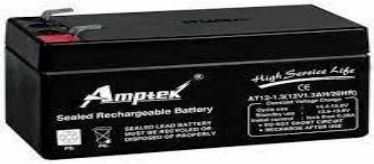
A solar cell panel, solar electric panel, photo-voltaic (PV) module or solar panel is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of PV modules is called a PV panel, and a system of PV panels is called an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment. In 1839, the ability of some materials to create an electrical charge from light exposure was first observed by the French physicist Edmond Becquerel.

EFFICIENCY

Each module is rated by its DC output power under standard test conditions (STC) and hence the on-field output power might vary. Power typically ranges from 100 to 365 Watts (W). The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 W module will have twice the area of a 16% efficient 230 W module. Some commercially available solar modules exceed 24% efficiency. Currently, the best achieved sunlight conversion rate (solar module efficiency) is around 21.5% in new commercial products typically lower than the efficiencies of their cells in isolation.

Solar panel conversion efficiency, typically in the 20% range, is reduced by the accumulation of dust, grime, pollen, and other particulates on the solar panels, collectively referred to as soiling. "A dirty solar panel can reduce its power capabilities by up to 30% in high dust/pollen or desert areas", says Seamus Curran, associate professor of physics at the University of Houston and director of the Institute for NanoEnergy, which specializes in the design, engineering, and assembly of nanostructures. The average soiling loss in the world in 2018 is estimated to be at least 3% - 4%.

3.4 BATTERY



A **battery** is a source of electric power consisting of one or more electrochemical cells with external connections[1] for powering electrical devices. When a battery is supplying power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal.

3.5 FLOOR CLEANER

A floor scrubber is a floor cleaning device. It can be a simple tool such as a floor mop or floor brush, or in the form of a walk-behind or a ride-on machine to clean larger areas by injecting water with cleaning solution, scrubbing, and lifting the residue off the floor. To remove stains, dirt, litter and obstructions. To remove grit and sand which scratch and wear down the surface. To remove allergens, in particular dust. To prevent wear to the surface (e.g. by using a floor wax or protective sealant). A **mop** (such as a **floor mop**) is a mass or bundle of coarse strings or yarn, etc., or a piece of cloth, sponge or other absorbent material, attached to a pole or stick. It is used to soak up liquid, for cleaning floors and other surfaces, to mop up dust, or for other cleaning purposes. **Cleaning** is the process of removing unwanted substances, such as dirt, infectious agents, and other impurities, from an object or environment. Cleaning is often performed for aesthetic, hygienic, functional, environmental, or safety purposes. Cleaning occurs in many different contexts, and uses many different methods. Several occupations are devoted to cleaning.

3.6 WATER PUMP

When the water reaches a pre-set pressure, the diaphragm engages the pressure switch which turns the power off at the pump. When the tap is opened a drop or decrease in pressure in the system disengages the pressure switch and this in turn tells the pump to start up. A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action, typically converted from electrical energy into hydraulic energy. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps.

3.7 MOTOR

A **DC motor** is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. The direction and magnitude of the magnetic field produced by the coil can be changed with the direction and magnitude of the current flowing through it.

3.8 FAN

A fan is a device with a rotating hub and radiating blades that are set at a pitch to form a helical spiral which, when rotated, exerts linear thrust upon a working fluid such as water or air.

4.1 PROJECT SETUP

4.2 ADVANTAGES

- Manual effort is reduced.
- Operating time is less.
- Cleaning and polishing can be done at same time.
- Power consumption is less.
- This machine requires low Maintenance cost.
- By further modification the drive or movement can be made automatic.

4.3 DISADVANTAGES

- Floor cleaning machine produces vibrations when used on rough floors or rough surfaces.
- Floor cleaning machine is Suitable for only flat surfaces.
- Floor cleaning machine is Semi-automated machine.
- It is heavy to lift.
- It is not capable to clean stair of any building.
- Maintenance of mop is required.

APPLICATIONS

- The floor cleaning machine is widely used in following places:-
- Hospitals, colleges
- Industrial floors
- Airports
- Offices
- Hotels

CONCLUSIONS

The project is about innovative floor cleaning machine. One of the key motives of our project was to cover the aspects of cleanliness in the society. The multiple applications provide a wide range of functions. Since our machine is Solar operated, it helped in making an environmentally friendly project. The use of innovative technology in our project helps in reducing human effort and also consumes less time in cleaning procedure. This means more floor cleaning which results in increase in overall cleanliness and supports healthy well being. Small steps in technological advancements like these will have higher impact in the long run in future.

FUTURE SCOPE

If panel used of high watt, then the machine can be used during night time for garden lighting or room lighting. Because we can store more power. And at night time however you keep it aside. So the power in the battery can be used for this purpose. By using one valve in the pipe we can also use it for gardening i.e. pouring water for plants. By connecting one box type carrier we can use it to transport files, books or other stuffs from one place to other in office or any other place.

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