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Design and Fabrication of Shoe Foot Cleaning Machine

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Abstract: *Indoor environment cleanliness is always a challenge because footwear acts as the main carrier for outdoor dust, allergens, and microbial contaminants. This paper details the design and fabrication of an automated shoe foot dusting machine to fill the gap between manual cleaning and high-cost industrial systems. The machine employs a sequence of rotating brushes run by an electric motor that removes dust effectively from the sole and sides of the shoes.*

Design considerations emphasize the safety of the user, ease of maintenance, and portability of the device. Experimental results demonstrate that the device reduces the amount of particulate matter tracked into a room, compared to traditional floor mats. This device represents an affordable solution for indoor air quality and floor hygiene in commercial and residential establishments.

Experiments prove that there is a substantial reduction in the level of dust tracked into houses with the use of this device compared to floor mats. This device looks forward to being a perfect, cost-effective solution in improving indoor air quality and floor cleanliness..

Keywords: *Indoor environment*

I. INTRODUCTION

Automatic Shoes Dust Machine The best application of the Dust Machine is in the hospital, house, auditorium, shop, computer center, etc. The machine has very simple components, which can be operated very easily. Anyone can operate this machine very easily. The machine has a large number of brushes, and this brush helps to remove the dust from the feet. Therefore, it has many applications in the hospital, house, etc. The time for cleaning is very less, and the cost is also less. The maintenance cost is less. There are many numbers of foot dust cleaning machines, which are working on different principles with high cost.

The drive system of our project is quite easy and very manageable to operate by anyone and also children. The machine will also be portable, so we can move it freely from one place to another place easily. It's also very important for everyone and all houses to have one like this as it will be easily operated by anyone and also children safely.

Keeping a clean and hygienic environment is of utmost importance in areas such as hospitals, modern homes, auditoriums, shops, and computer centers. The entry of dust into such crucial areas mostly comes from footwear. To reduce this problem, we have developed the Automatic Shoe Foot Dusting Machine.

The above device is an efficient tool to remove dust from shoe soles. The device is made up of high-quality brush pieces driven by a drive mechanism. As one steps onto the device, the brush pieces rotate to remove the dust efficiently. Dust is an environmental factor within many settings such as computer rooms and operating rooms. It is worth noting that dust poses hazardous conditions if present in small quantities. Despite the existence of dust-removing machines specifically used to clean feet, the existing machines are complex and expensive.

Safety first: As you discussed that this device can be used for children as well, it is important to add safety guards or a low-speed motor in your design description.

Portability: If you've added any portability features, such as wheels or a handle to your machine, be sure to point out that within the "Construction" category.

Cleanliness and hygiene play a vital role in maintaining a healthy and productive environment in both homes and workplaces. The most common and disregarded source of indoor pollution is dust and dirt brought into buildings through footwear. Shoes come into direct contact with the outdoors, be it on roads, building sites, playgrounds, or other

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industrial areas, where dust, mud, and other contaminants easily stick to the soles and sides of shoes. When one enters the premises without proper cleaning of footwear, all those contaminants enter inside with him, thereby leading to unhygienic conditions, more cleaning effort required, and health hazards.

Traditional methods of dust removal include simple doormats, rugs, or manual brushing. These are usually quite inadequate to remove fine dust particles, sticky mud, or debris lodged deep inside the grooves of the sole. Manual cleaning is also time-consuming, inconsistent, and requires excessive use of user effort. Due to this reason, the accumulation of dust inside buildings has become a persistent problem, especially in high-traffic areas like schools, hospitals, offices, factories, laboratories, shopping malls, and homes.

With an increasing emphasis on hygiene, automation, and maintenance systems, an improved and more user-friendly system is necessary. The shoe dust cleaning machine offers improved benefits over traditional cleaning methods through its mechanical system that cleans footwear quickly and effectively prior to entry. The fabrication of a shoe dust cleaning machine focuses on developing a practical, low-cost, and reliable device that can greatly reduce indoor dust contamination.

With the advancement of urbanization and industrialization in modern society, the level of dust has increased in outdoors. The roads, construction activities, vehicular movement, and industrial emissions generate fine dust particles that easily cling to footwear. When these particles are carried indoors, they settle on floors, furniture, and equipment, causing frequent cleaning requirements and hence contributing to air pollution within the enclosed space.

Even a little dust can create serious problems in sensitive environments like hospitals, laboratories, and clean rooms. It can contain microorganisms, allergens, and noxious substances that could present health risks to the occupants. In schools and offices, too much dust affects cleaning, comfort, and aesthetic appeal, thereby providing an unpleasant atmosphere.

Manual cleaning of shoes is not only cumbersome but it's very impractical for places that experience a lot of foot traffic. Doormats get saturated with dirt in no time and stop serving their purpose; vacuum-based systems are mostly expensive and require regular maintenance a well. These challenges call for an automated solution for cleaning shoes efficiently, effectively, economically, and without operational difficulty.

Problem Statements

- In High Contamination: Foot traffic carries pollutants like dust and allergens from the outdoors into the clean environment of a building through shoes.
- Health Hazards: Shoes contain hazardous microorganisms like E. coli and S. aureus, which can lead to health hazards in hospitals and homes.
- Ineffectiveness of Mats: Conventional doormats clean the sole surface area but do not remove embedded dirt present inside the grooves of shoes.
- Bacterial Growth: Mats that tend to accumulate in many places can become wet due to poor draining, creating "puddles" where rather than removing bacteria, more are fostered.
- Manual Effort: Manual shoe cleaning with the help of hand-held brushes takes a long time and can cause fatigue. However, it lacks relevance to the user.
- High Cleaning Costs: The large amount of dust results in frequent and expensive professional floor cleanings and damages expensive carpets.
- Need for Automation: Currently, nothing is available which is affordable, automatic, and small enough to provide effective cleaning of shoes at the point of entry.

II. LITERATURE SURVEY

Design of Shoe Sole Cleaning with Polishing Machine Sreenivas HT, Shankar Gouda, Vol. 2, Issue 9, September 2013

In this work, it is proposed to design a shoe sole cleaning machine, incorporating shoe polishing facility with this machine. As all the employees, faculty etc required to wear clean shoes before entering their laboratories, as these

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laboratories have highly précised instruments, sensors etc and the air inside should be very clean. Thus, shoe sole cleaner with shoe polishing machine is designed, considering all the parameters with respect to customer need in terms portability and also economically available to the but also provide the style quotient to the person with polishing effect.

Automatic shoe polisher prototype development using the application of value-added analysis. pavankumar s maro11, a.balakrishhna, krishna.p

This paper reports the design and development of the automatic shoe polishing machine which works using the electric polish dispenser. As all the students, especially school children and employee need to wear clean shoe. This automatic shoe polishing machine reduces the disadvantages in the current product available in the market. This machine is designed on the basis of time reduction in shoe polishing and to cover the full portion of the shoe with polish. By taking all this into account it reduces the manual shoe polishing and it helps to use the modern techniques

Literature Review

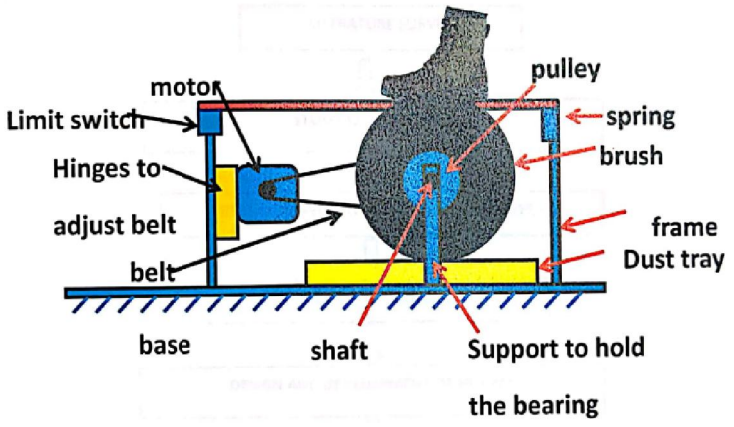
The Design and Fabrication of a Shoe Foot Dusting Machine tackles the important problem created by the shoe that pollutes the house. Studies show that the shoe acts as the main medium for dust and germs such as E. coli that can transfer as much as 99% to the floor. The normal dusting mat does not remove the embedded dirt and can become full of dust.

This project offers an automated solution with a motorized brushing system designed to clean the fine threads of shoe soles effectively. The device has been developed with the aim of being simple, portable, and less expensive so as to suit its application in hospitals, labs, offices, and even residences. The device incorporates an automatic activation system for convenience and has a tray designed for easy disposal of clean dust. The introduction of this efficient mechanical system for cleaning purposes has improved air quality in premises significantly while lowering floor cleaning expenses and raising cleanliness standards in controlled environments such as labs.

III. METHODOLOGY

The development of the automated shoe dusting machine was done in a systematic manner consisting of three main steps: design and materials, fabrication, and testing. The first step in the development process involves conceptualization and design of the structural make of the machine. This entails the creation of a compact and ergonomic structure that can sustain the weight of the operator. In terms of materials, durability and economic viability are key. This is achieved using a mild steel structure and high-density nylon brushes. The mechanical fabrication stage consisted of the integration of an electric motor with high torque value and a pulley belt system to power the brush mechanism. For the purpose of automation, an infrared proximity sensor was incorporated to sense the proximity of the shoe, which in turn switches on the electric motor using a relay circuit.

LINE DIAGRAM



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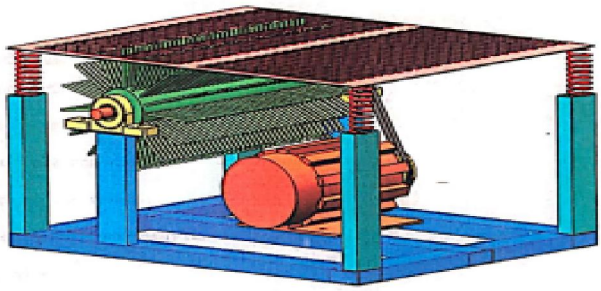

IV. CONCLUSION

The designing and manufacturing of the automated shoe dusting machine solve the problem of an affordable, efficient, and convenient indoor hygiene solution because the machine replaces the previous manual process used to clean the floors by implementing the motorized brush system that guarantees improved indoor hygiene conditions by reducing the entry of allergens and dust into the indoor environment.

In conclusion, this product has proved to be a pro-active method of enhancing indoor air quality and reducing flooring maintenance expenses. This product fills the gap that lies between a floor mat and an industrial machine that is typically very costly.

We have taken up this project as real challenge, as we were not experience in the field. We started our work on this project facing new hurdles initially. After the completion of the project work, we tried it working in our college machine shop and we were pleased to note that it does meet the requirements for what it is meant. The maneuverability of the device is quite good and the handling is quite simple. For commercial purpose one can improve the efficiency of the device effectively by increasing the size of the device.

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