

DESIGN AND FABRICATION OF VACUUM OPERATED CHALK DUST COLLECTOR

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Abstract - *The history of teaching dates back to the start of the first man's expertise and information passed from generation to generation. Teaching and learning in schools and colleges are done over the years by writing on boards and using various innovations and improvements of the modern technology. This project involves the design and construction of an advance black board duster cleaner by VACUUM technology.*

Key Words: Cleaning, effective, hazardous.

1. INTRODUCTION

1.1 Vacuum

Vacuum is space of matter. The word stems from the Latin adjective *vacuus* for "Vacant" or "void". An approximation to such vacuum is a region with a gaseous pressure much less than atmospheric pressure. Physicists often discuss ideal test results that would occur in a perfect vacuum, which they sometimes simply call "vacuum" or free space, and use the term partial vacuum to refer to an actual imperfect vacuum as one might have in a laboratory or in space.

A Vacuum Gauge is a pressure measuring instrument that measures pressure in a vacuum. Generally this pressure is usually below atmospheric pressure. These vacuum gauges can be used either in receivers of air pumps or in steam condensers. Vacuum pressure is the additional pressure in any system that is relative to the atmospheric pressure. It is also known as pressure gauge.

1.2 Vacuum Cleaner

The end of the 19th century saw the introduction of powered cleaners, although early types used some variation of blowing air to clean instead of suction. One appeared in 1898 when John S. Thurman of St. Louis, Missouri submitted a patent for a "pneumatic carpet renovator" which blew dust into a receptacle. Thurman's system, powered by an internal combustion engine, traveled to the customer's residence on a horse-drawn wagon as part of a door to door cleaning service. Corrine Dufour of Savannah, Georgia received two patents in 1899 and 1900 for another blown air system that seems to have featured the first use of an electric motor.

1.3 Vacuum chalk eraser cleaner – clean & dustless

Dust Suit for School/Office/Home use to reduce the Eraser Chalk Dust Allergy Very Easy—Revolutionary New Patented, Multi-Stage Dust 3 in One HEPA Cleaner Dust Electric Vacuum Chalk Eraser Cleaner can clean all kinds of chalk eraser cleaner such as cotton chalk eraser, sponge chalk eraser, and felt chalk eraser in only seconds. It is a very new innovative patented green product; it could reduce much more cost and labor not only for the school chalkboard and kids easel chalkboard Eraser cleaning but also suit for duster which can use in place to clean computer, whiteboard, screen, furniture and take care the health for teacher, student, and housewife.

Base on the 13 years experience for manufacture, 2nd Dust Multi Functional HEPA Vacuum Eraser Cleaner. We have many innovative in the new model, such as HEPA Filtration ,dust full indicator, dustproof cover, dustproof cover misdirection protect, HEPA filter install failed protect, dust bag absent protect, replaceable slice brush, and so on, More safety and easy to maintain.

The blackboard eraser is nothing more than a block of wood with felt cloth stuck on it. Felt is made from wool. Felt is made by a process called wet felting, where the natural wool fiber is stimulated by friction and lubricated by soapy water. The result is the cloth we call felt.

2. METHODOLOGY

System works on vacuum process for cleaning the blackboard duster with the help of the motor. Motor will run the vacuum pump. A simple on/off switch is also going to play minor role in this system for stopping the motor and thus the vacuum pump. A vacuum dust collection system is going to be used to collect and trap the dust found on the eraser which will save energy, time and eliminate the dust from circulating in the surrounding air and creating a hazardous environment for both the teacher as well as the student. When the controller button is pressed the circuit gets activated and starts the vacuum process. And the chalk eraser is moved over the vacuum slot. When this is done the dust from the eraser is pulled out of the material due to the suction produced from the vacuum pump. Thus, avoiding the chalk dust entering into the classroom atmosphere.

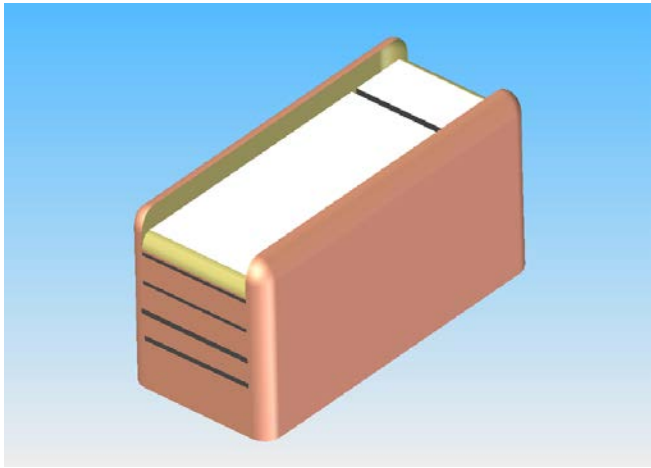


Fig -1: Construction of model

3. FEATURES

- High Efficiency Particulate Air (HEPA) filter: set ahead the motor, can suck up the dust completely and keep the discharged air clean, and also can prolong its life-Dust HEPA Vacuum Chalk Eraser Cleaner.
- Dust full indicator: when the dust bag or HEPA filter are full of dust, the “dust full indicator” will turn to red-Dust HEPA Vacuum Chalk Eraser Cleaner.
- Dustproof covers: This product is applied with exact hermetical also durable for cleanout structure. That make this appliance can keep clean inside and outside for a long time, also can keep dust from spreading effectively which will pollute those inner components. It also can reduce the time spend on maintenance and avoiding those spreading dust suck into motor for prolonging the life of motor-Dust HEPA Vacuum Chalk Eraser Cleaner.
- HEPA filter install failed protect function: While the HEPA filter is not installed, it will do not work for protecting motor and keeping the dust from HEPA Vacuum Chalk Eraser Cleaner.
- Dust bag absent protect function: If dust bag is absent or placed incorrectly, the top cover will cannot be the closed Dust HEPA Vacuum Chalk Eraser Cleaner.
- Replaceable slice brush: Cleaning the dust thoroughly, if it is wore away, which can be replaced by one self easily Dust HEPA Vacuum Chalk Eraser Cleaner.
- Overheat protect function: Equip with “Reset thermostat protector” on the motor to prevent the motor from any breakage caused by overheat-Dust HEPA Vacuum Chalk Eraser Cleaner.

3. ADVANTAGES AND DISADVANTAGES

- Chalk requires no special care; whiteboard markers must be capped or else they dry out.
- Chalk is an order of magnitude cheaper than whiteboard markers for a comparable amount of writing.

- It is easier to draw lines of different weights and thicknesses with chalk than with whiteboard markers.
- Dashed lines can be drawn very quickly using a technique involving the friction of the chalk and blackboard.
- Chalk has a mild smell, whereas whiteboard markers often have a pungent odor. Chalk writing often provides better contrast than whiteboard markers.
- Chalk can be easily erased; writing which has been left on a whiteboard for a prolonged period may require a solvent to remove.
- Chalk can be easily removed from most clothing; whiteboard markers often permanently stain fabric.

3. CONCLUSIONS

The model has been designed to collect the chalk dust which was getting into the class room atmosphere and causing suffocation to the people. After undergoing several reviews from the experts, by using the vacuum principle and the microfiber, this machine can successfully collect the complete dust from the duster and avoid the dust getting into the classroom atmosphere.

4. CAED MODELS

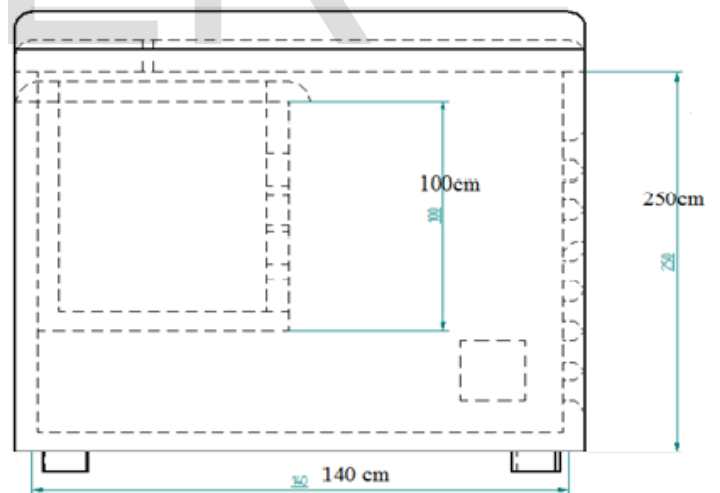


Figure 4.1 Dimensional representation

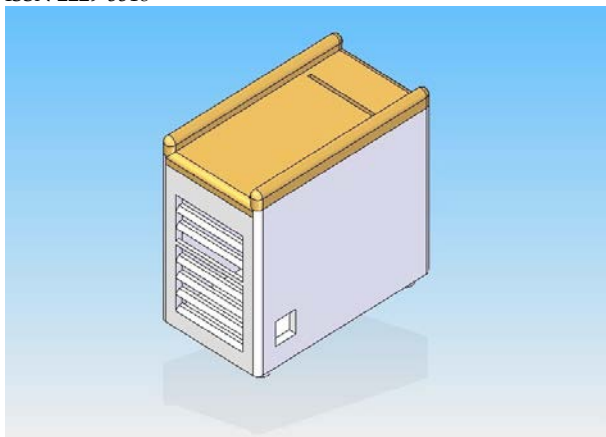


Figure 4.2 CAED Model

5. EXPERIMENTAL CALCULATIONS

5.1 Formulas

Electricity consumption: - $E = W \times n$ kW/hr.

Average cost of consumption: - $C = E \times 8.2 \times D$ Rs/month.

Where,

E=Electricity consumption.

n=No. of hours used.

W=Operating Watts of the pump.

C=Average cost of consumption.

D=No. of days used.

8.2=Cost per kWh in Karnataka.

5.2 Calculations

1. $n = 6/60$ hrs

2. $E = (400 \times 6/60)/1000$
 $E = 0.04$ kWh

3. $C = 0.04 \times 8.2 \times 26$
 $C = 8.528$ Rs/month

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