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Development of New Design of Automatic Blackboard Cleaning System

Neeraj Saraswat[1*], Nikhil Tyagi[1]

[*]*Department of Mechanical Engineering ,Sunderdeep Engineering College, Ghaziabad, India*

ABSTRACT

*An **Automatic blackboard cleaner** is a device that is generally used to clean board automatically with the help of duster. . Assembly language is used to program the parallel port to be able to manipulate the movement of the cleaner. The parallel port was used so that the program would be able to interact with the circuitry fully. The design will erase the writings on the board without the user exerting so much effort, prevent straining oneself, and be able to reduce the time used. Electronics, Microprocessors, and Assembly Language are the essential courses used as basis for the design's internal structure. The mechanical aspect of the design is based on the idea of a sliding door. The Automatic Blackboard Cleaner's intended application is to erase the writings on the board which would consume less effort and time compared to manual erasing but still efficient. With the use of Assembly Language, the intended operation of the design could be achieved by a push of a buttonThe project automatic blackboard duster is device that clean the blackboard automatically and reduces the time consume in hand erasing.*

The traditional blackboard chalk dust is a common problem in the traditional blackboard-eraser-chalk architecture. It is generally known that erasers for cleaning the black boards in college rooms soon become saturated with chalk dust and have to be cleaned. In the past, this has usually been done by clapping the erasers together. This operation produced a great deal of dust that is rather objectionable both from the standpoint of health and cleanliness.

The design is able to achieve automated clean the blackboard and collect dust in one stroke. In this paper, it introduces the design and principles of sliding type wipe mechanism and also carried out the implementation and experimentation for motion analysis.

The principal object of the present automatic blackboard duster is to provide an attachment for blackboards in the form of a power driven erasing apparatus which can be set in operation by the throw of a switch, thus eliminating the drudgery of manually cleaning Blackboard.

***Keywords*: Blackboard Eraser, Intelligent, Wipe System, Mechanical Structure, Sensor etc**

I INTRODUCTION

The time of installation to fit the adjusted frame size **T**he Automatic Blackboard Cleaner is introduced as a design project that automatically erases the contents of a blackboard with only a push of a button. The Automatic Blackboard Cleaner will be useful to lecturers who often use blackboards as medium in imparting knowledge to listeners. It will lessen the time and energy required to erase the board, especially for those who have very long lectures. It would be of great help for them since they would not be wasting time in erasing the board, and they would have more time to spend in lecturing. Automation is very much of use in this age. As with the flow of the technology, the significance of carrying out the design is to provide a better quality of doing such work. Upgrading manual application of erasing to automatic application is in line with the trend of the modern era where simple manual applications are modified or upgraded to lessen the time used in doing the work. The operations that would be required to move the cleaner through the board surface that could be implemented using sub-circuits were implemented using pc interfacing, thereby reducing the need for a bigger circuit.

The device is comprised of an adjustable frame and sponge which is trimmed at The effectiveness of a teacher or lecturer using blackboard in his presentation to a class or audience is materially affected to his disadvantage by the necessity of stopping blackboard work from time to time to erase and this stoppage becomes progressively greater disadvantage as the size of the board and the expanse of coverage thereof increases. While some attempts have been made to provide automatic chalkboard erasers, still such devices have not proven particularly successful and therefore are not generally used or available.

The design is able to achieve automated clean the blackboard and collect dust in one stroke. In this research paper, concept puts forward a kind of mechanism design scheme, the mechanism can automatically detect the blackboard chalk stains and erase the font, keep the blackboard clean.

II SURVEY TAKEN FOR THE CONCEPT DEVELOPED

The purpose of this study is to develop a conceptual model that describes the relationship of other studies to the design project. Articles and previous design projects about the design's major components such as the use of assembly language, parallel ports, DC motors, and SPDT relays are essential in creating the Automatic Blackboard Eraser.

According to the study entitled, "Use of a PC Printer Port for Control and Data Acquisition", in interfacing the parallel port, one must first know the address on which to access the said port of the computer. The parallel port can usually be accessed through the data port address of 3BCH. This address value differs depending on the computer manufacturer and for the computer models. It is also dependent on the number of ports that are available in the computer. The other addresses that the parallel port could use would be at 378H or 278H. The status port address would be found at data port plus 1, and the control port address would be found at status port plus 1. (Anderson, P.H., 1996)

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According to this study, the motor should not be switched from one direction to another unless it is stopped or set to a rest before. Putting a motor straight into into the opposite direction would be quite dangerous because when running a motor, it develops a back emf voltage which could add to the current flow in the opposite direction and probably cause arcing of the relay contacts.

When the forward button is pressed and released, the motor will run continuously in one direction. The Stop button must be used before pressing the reverse button. The Reverse button will cause the motor to run continuously in the opposite direction, or until the stop button is used. (Collinson, A., 1995)

III CONSTRICTION AND WORKING PRINCIPLE OF CLASSROOM BLACKBOARD ERASING MECHANISM

3.1 Design Procedures

The Automatic Blackboard Eraser makes use of a motor, particularly a DC motor that will be responsible in moving the eraser from one point to another. A relay module is used to power the eraser's motor. This module will be connected to another module containing the parallel port for the interface. Through PC interfacing, assembly language will be used in manipulating the movement of the eraser.

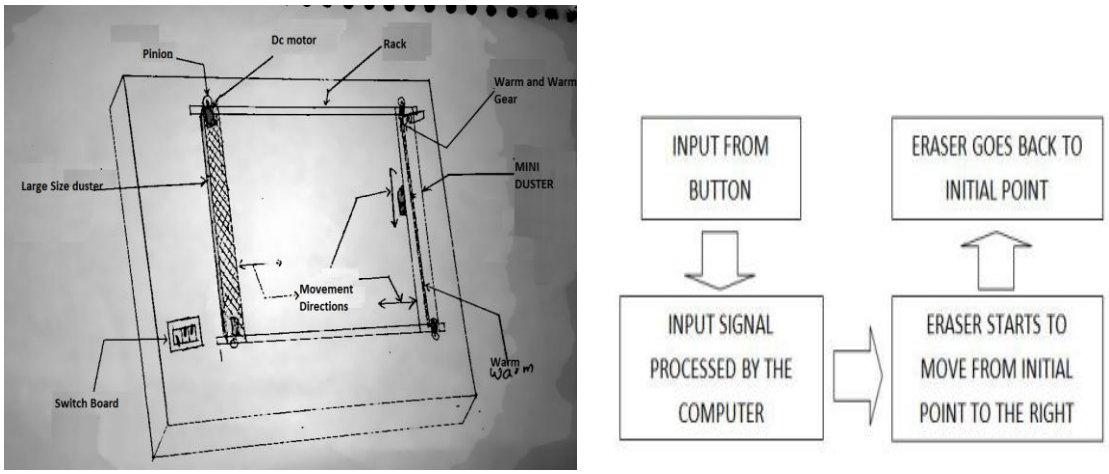

Fig. class room blackboard erasing machine mechanism and its operating circuit

3.2 Design Methodology

CALCULATION

Pressure angle ′ ∝'= 20®

Coefficient of Profile Shift 'X' = 0

No. of teeth 'z'= 25

Height of pitch line 'h'= 18.5mm

Diameter of gear 'd' = 40 mm

Pitch Diameter 'Pd' = 39mm

Base Diameter 'd_b' = 37.5mm

Working pitch diameter 'd_w' = 39.8mm

Center distance 'a' = 39mm

Module 'm' = (a-H)*2/z

= 1.52

Addendum'h_a' = 15.2mm

Whole Depth 'h' = 34.2mm

Outside Diameter 'd_a' = 39.52mm

Root diameter 'd_f' = 32.68mm

Selection of Motor-Minimum pressure required to clean black board=1200 N/m2 Area touching blackboard is given by a=0.05×0.60=0.03 $m2$, μ=coefficient of friction=0.5,

Rn = P xA=36N, F = $\mu \times RN$=18N, this force is given to slider with help of strings. Strings are wound to motor with pulley of 20 mm radius. Torque required by motor=18×0.02=0.36N-mm, Power required with 3000RPM = 113.04W =0.15HP,

Selecting standard motor of 3/16 HP (0.1875 HP) from that available in market.

Selection of Nylon string- $\boldsymbol{Stress}\sigma ny$=75$Mpa$, Force required to pull the slider F= 18 N

$\sigma ny = F\pi d2$, 75 = 18$\pi d2$, d=1.15, Diameter of string =1.25mm

Design of Screw-Shearing force acting on Screw F=$W \times e$=1.962 x450 =882.9 Now,Ssy for aluminum = 207 MPa, σsy=2073.5=59.17 MPa Now, $\sigma sy = FA = F\pi 4 \times dc2$ = dc = 4.35 ≈5 mm , therefore, screw diameter = 5mm

Design of cross guide rail – Total Mass =Mass of Sliding bar + Wet sponge + Four roller wheels Maximum Bending Moment acting on cross guide rail = $W \times x4$ = 441.5N.mm, Where, x= Length of Cross guide rail = 900mm, for rectangular cross section, I=20×$t312$, y = t/2,=483Nf=138 MPa,

We know, MI= ,=0.97 mm ≈1 mm,For C channel cross section, I=1×(11)3+1×(11)3+20×(1)312 =223.5 $y = A1 \times y1 + A2 \times y2 + A3 \times y3 A1 + A2 + A3$ =3.118 mm,

From relation, MI= ,=13.59 MPa,

this stress is less than allowable stress.

IV CONCLUSION

Compared with manually wipe, smart wipe has a good effect and runs smooth with good reaction speed. The rate of rotation of the motor can be set in accordance with the requirements of the wiping speed to suit the requirements of different occasions. The smart eraser has a simple structure, easy to operate, easy to obtain raw materials, manufacturing equipment simple process. Its Control functions, and less susceptible to interference, high reliability, ease of use, can make products with high performance and low cost. The product is suitable for large, medium and small institutions, the promotion of certain significance

REFERENCES

[1] Hu, Z. Y., & Wan, H. A pressure cleaner of blackboard eraser.Journal of Wuhan Institute of Shipbuilding Technology, Wuhan.2006.

[2] Ren, Z. G., Chalk dust on the health hazards of teachers (in Chinese). Chinese Journal of School Health, 2,2002, 189.

[3] Pu, L. G., &Ji, M. G., Mechanical design Beijing: Higher Education Press. Qian,7,2001, 167-170.

[4] Yang, S. Z., &Chong, Y. K., Mechanical engineering control. Wuhan: Huazhong University of Science and Technology Press. 2007

[5] Wang, X. F., Song, X. T., & Wang, Z.,Innovative Design of a New Mechanism to Clean the Blackboard.Mechanical Engineer, 2009.

[6] Deng, X. Z., Electric Drive Control. Wuhan: Huazhong University of Science and Technology Press.2002.

[7] Billie R. Chrisp, Automatic Chalkboard erasing apparatus, United States Patent, Filed July 7, 1971, review on May 8, 1973

[8] Gaylord A Williams , Chalkboard Cleaning Apparatus with fluid reservoir, United States Patent, Filed Aug 11, 2003, review on Sept 20, 2005