



Semi-Automatic floor sweeper

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Abstract: This study is to be performed to reduce the muscular effort of target people who feels tiredness and muscular pain while sweeping the floor since floor sweeping is an activity that takes almost an hour to sweep floor of an average house of about thousands of square feet.

Index Terms – introduction, importance, Objective, Theoretical framework, Working, Components, Testing ,Conclusion, References etc

I. INTRODUCTION

A Semi-Automatic floor cleaner is a mechanical component embedded Appliance for daily house hold floor sweeping, it is actually a compact and modified form of Heavy duty commercial floor sweeper machine but only the difference is that it is light in weight so that it could be guided by hands. It is basically motor driven disc which has carpet pasted over it that sweeps the floor by sticking the dust on its carpet surface which will be wet for sticking the dust particles over it, since there will be spraying nozzle mounted on the guiding handle of this machine that will spray the liquid floor cleaner filled in container through a direct current pump. To avoid regular dipping of sweeper into liquid cleaner bucket, a container is mounted so that the machine will gain some weight to press the cleaning disc for more effective cleaning of floor.

1.1 Importance

In a urban area of almost every states of India, it is very challenging activity to manage time for cleaning floors, since it is a time consuming activity that takes almost a hour to complete this activity of floor cleaning so that almost everyone hires a house cleaning person to clean their homes in which major part of the work is dust cleaning and floor sweeping, dust cleaning could be easily done by vacuum cleaner but floor sweeping is a task that takes time which gave rise to think and develop such machine that resolve this problem of floor sweeping.

1.2 Objective

- To develop an alternative of a cleaning staff for domestic work of floor sweeping.
- To reduce the time consumption
- To reduce strain and dirt.
- To make the cleaning more precise
- To reduce human effort
- To enhance the performance
- To reduce muscular effort.
- To reduce the sequence of activities used for floor weeping
- To make equipment more portable

1.3 Theoretical framework

The working of machine is based on a simple theoretical approach that for sweeping a particular area, it is required that sweeper has some width that comes in contact of the floor , so theoretically , the area of sweep would be simply width of the sweeper multiplied by sweeper guided along the length for more than one time , suppose 2 times so that the area swept is 2 times to reduce this effort of multiple time we used the circular motion of sweeper instead of multiple linear motion of the sweeper which reduces the arm effort and makes the sweeper more effective so that it could be used to swept the floor just by guiding it on the targeted floor at one time. The sweeper is rotated by a DC geared high torque motor of maximum torque of 0.5 Nm and having speed of 150 RPM . Simultaneously to reduce another muscular effort that is for dipping the floor cleaner into liquid floor cleaner inside bucket . to reduce it we added a small container on the guiding handle of the machine and it will used to store the liquid floor cleaner and for spraying through the spraying nozzle. In this way the whole floor cleaner will help to reduce the time and labour .The purchasing power of money decreased due to inflation, and due to which the investors demand high rate of return, and the prices decreased with increase in required rate of return (Iqbal et al, 2010).

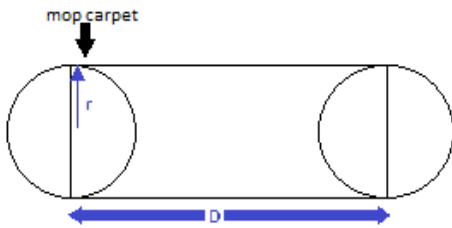
Equations

According to effective sweeping with neglecting the corner of a rectangular area the equation is as follows).

$$A = \pi r^2 + D \times 2 \times r ,$$

Where D = Distance travelled in guiding along the floor

R = radius of the rotating sweeper



II. Research and Methodology

- The research comprises of series of attempts for the effectiveness of the project .This includes some assumptions for the research and some experimental approach as like as like observing the degree of cleanliness checked manually and also includes the observation about how much the floor will be wet after sweeping since pressurizing sweeping result more dry floor which don't need to be dried by turning fan on.
- To observe the degree of dryness we had used very simple techniques as lie use of tissue papers , weight blocks etc.
- Research is carried out after consecutive testing and data collection.

2.1 Data and Sources of Data

Weight of block	Weight of tissue paper
50g	19.7mg
100g	11.3mg
500g	4.4mg
1000g	4.4mg

We have collected data on the following basis as we operated the small prototype by keeping the bottles filled of water of capacity 50ml, 200ml 500ml and 1000ml over the guiding handle of it and observed the water film on floor. Sweeping water layer by tissue paper, after sweeping, measured the weight of every tissue paper consequently. Then we had prepared a table with the

parameters as like weight of the block (used bottles as block) and weight of tissue paper. Higher the weight of tissue paper means lower the dryness of the floor.

2.2 Observation on rough experiment

According to the theoretical framework, the addition of weight means the pressurizing of the the floor cleaner to the floor for more finishing in the work of the floor cleaner, since we know that, for more dry surface we have to drive the sweeper by little bit of pressing toward the floor. To substitute the muscular pressure by weight pressure that will result the handling much lighter .

We used the weight of tissue paper to analyze the amount of dryness as higher the weight of tissue paper higher the tissue paper absorbed the water from the floor so that it could give the idea about the degree of dryness to the floor.

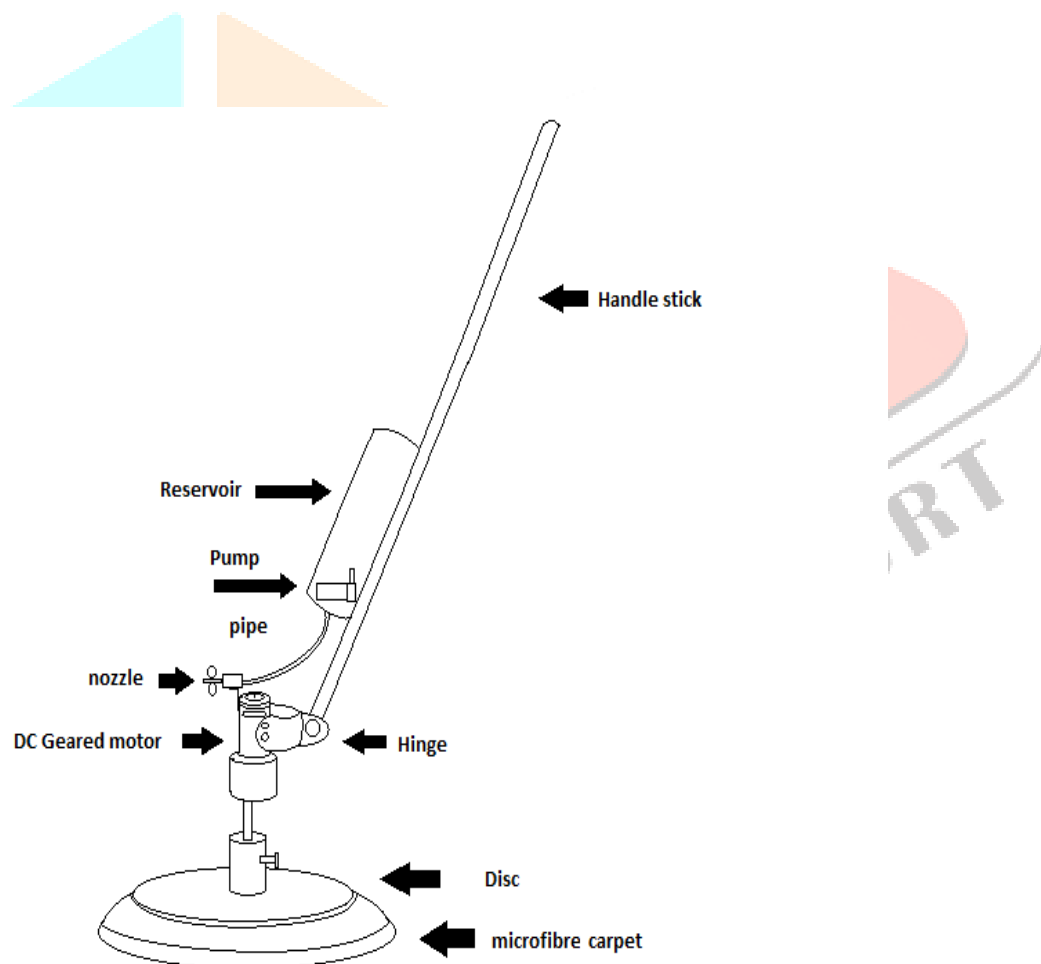


Fig 1.1: Design of the project according to our assumption

2.3 The certain things which have been omitted out are as follows :

1. Use of lightweight hollow pipe instead of whole solid wooden handle.
2. Highly dust sticky carpet disc for sweeping the floor surface.
3. Capillary ducts in the sweeping disc for its anti wet performance.
4. Lubricated hinge for the better flexibility.
5. Lithium ion battery instead of lead acid battery for lightweight and high backup.

III. Working

Floor sweeper is actually combination of sweeper of domestic use and industrial floor sweeping machine. It has a circular microfiber carpet mop which is motor driven and motor is operated by a lithium ion battery which is controlled by an ON/OFF switch. And a container is mounted on the guiding handle/ stick of the project to store the liquid floor cleaner inside it, a DC pump is fitted inside the container to pump the liquid cleaner to the nozzle to spray liquid cleaner whenever it is needed it is connected parallel with the DC motor with a button switch.

3.1 Components

Motor

The motor is wiper motor used in cars. It requires 12V battery to operate .Basically it gives two speeds high and low which are suitable for floor cleaning.

Cleaning disc

The Diameter of wiper is approx 180 mm and pivoted at 10 mm from centre of motor

Microfiber Cloth

Microfiber cloth is used. Water soaking capacity is comparatively greater than any other alternatives.

Battery

12V battery is used for driving the wiper motor. It is rechargeable battery and can be operated for 3-3.5 hrs. It can be charged in 1hr by regular A.C. supply

SMPS

Switched mode power supply (SMPS) converts A.C to D.C .It converts 230V A.C to 12 volt D.C. It is mainly used in home appliances.

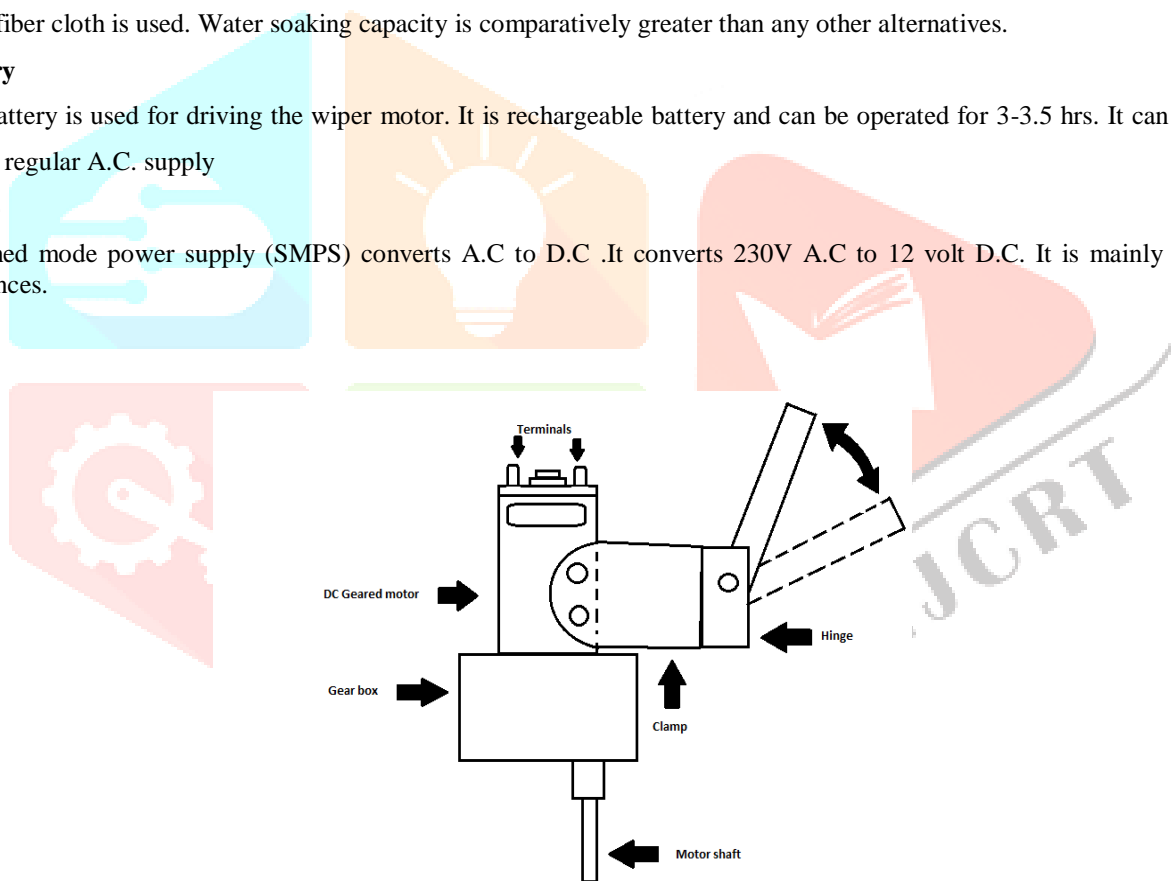


Fig 1.6: Figure of movement direction of handle stick from hinge with motor clamp

3.2 Dimensions & Specification of components

Dimensions

Diameter of the disc	6 inches
Length of handling stick	4 feet
Diameter of shaft	5 mm
Gross weight of the project	6 kg (approx)

Specifications of motor

Motor type transmission.	DC Geared speed reduction motor with bevel gear attached output shaft for perpendicular
Max power	30 W
Max torque	0.25Nm

Voltage supply	12 V
Safe Current supply	2 Amps



Figure: DC motor (bevel geared with speed reduction high torque motor)

Testing:

The motor being tested with the cleaning mop with manual pressing on a glass slab and on the tiles and cemented floor it was found that the project worked similar in case of tiles and glass slab but it was more effective on cemented floors since adsorption of dust on the cement floor is high and dust particles sticks on the mop since floor cleaner works as adhesive for mop and dust.

Conclusion

Testing result shows that the project is capable for the mentioned task so that it could be utilized for domestic purpose since there is no parameter that shows the degree of cleanliness of the floor but after sweeping the clear and clean floor surface arises that is sufficient for the conclusion that project is working properly.

Applications:

Hospitals - it could be used in hospitals since it more quicker in performance it could maintain hygiene as required.

Railway station -it is used at railway station from many years but of huge size but the project could be used in waiting areas.

Industries- due to its low maintenance it could be used in industries too.

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