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L.B.H.P. (Low Budget High Power) Leaf Vacuum Machine

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Abstract - The purpose of this project is to design and create a floor and road cleaning machine for colleges, hospitals, auditoriums, and workshops. A "low-cost high-power sweeper with lattice blades" was created and developed as a new way of implementing street cleaning on streets and university floors. This paper presents the design and development of a mechanically operated leaf sweeping machine. With technological development, automated leaf sweeper machines are getting more attractive to researchers to make life easy and comfortable. The concept is evolving in economic countries this leaf cleaner machine is designed by keeping the basic considerations for the reduction in cost and efforts while being environmentally friendly and easy to handle. The machine will work on electricity and will consist of simple fabrication.

Key Words: **Leaf sweeper machine, reduction in cost and effort, manually operated, easy to handle.**

1. INTRODUCTION

For the regular cleaning of the roads, floors, and different types of surfaces, different types of devices are used which depends on the place where it gets used. There is hardly any device used for the cleaning purpose of all types of surfaces and not only this effective cleaning of that particular surface or area can not be done by every machine. The cleaning job can be physically demanding and the need for methods developed to systematically evaluate the ergonomics of new products has been identified. Many surface sweeping machines are available in the market but we are going to develop a machine that is not only easy in construction and assembling parts but also easy to use. People can easily operate these machines. Fully automatic and Semi-Automatic machines that are available in the market are of high prices and heavyweights. So by focusing on both weight and cost, they are not affordable for everyone, such as the organizing committee of hotels, hospitals, hostels, etc. Hence, there is a need to design and develop such a floor cleaning machine that can be easily used and cost-effective. Everyone can use this machine easily and not only the time for cleaning is less the cost is also low. Maintenance costs are also low. Most of the machines available in the market are gas-operated, some regions have a higher gasoline price so we decided to make its electricity operated one.

1.1 Problem statement

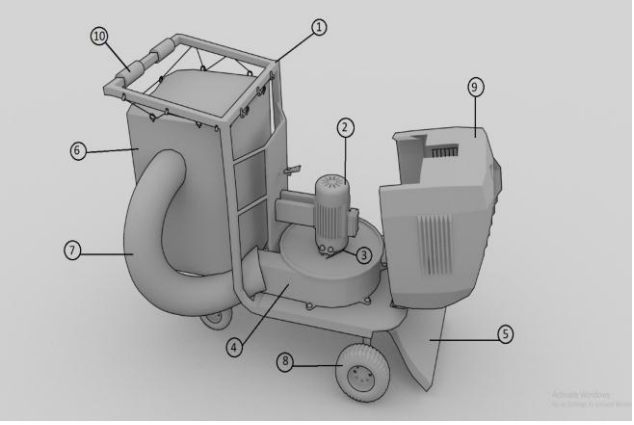
One of the major bills facing developing countries is cleanliness. To deal with these kinds of issues, new machines which are more improvised and effective but also of higher costs are purchased from the market every year. These machines have their very own limitations of entering every kind of surface to make it clean. On one hand leaf, sweeping machines are snatching municipality workers job, but Road sweeping machine is manually operated and best for collecting leaves from streets. Expenditure on importing these machines is really high and even after knowing their inability to reach narrow spaces, Roadside leaf sweeper is cost-efficient as compared to other cleaners available.

1.2 Objective

The objective of this project is to make a semi-automated floor cleaning machine.

- To design and develop a road cleaning machine capable of cleaning the road as well as around space.
- To make a machine operate manually so that it requires less power supply.
- Reduce the overall cost. To make the machine economical.
- To increase the effectiveness of floor cleaning
- To create a machine that made the cleaning work, easy and quick.
- To provide the alternative method for road cleaning.
- To reduce human efforts and to save time.
- To prevent injuries - Injuries caused by slips and trips on smooth surfaces can be more dangerous and maybe result up to death. Improper cleaning of surfaces is an important topic in itself.

2. COMPONENTS



No.	Components	Materials
1.	Frame	Iron
2.	Motor	Mild steel
3.	Impeller	Aluminum
4.	Housing	Aluminum
5.	Suction chamber	Aluminum
6.	Bag	Plastic/ Cloth
7.	Pipe	Flex PVC
8.	Wheels	Pneumatic
9.	Cover Body	Plastic
10.	Hand grips	Eva Foam

2.1 Motor

DC Shunt motor is used in the project as a constant speed is required to maintain the airflow throughout certain chambers and pipes. In a DC shunt motor, there is an armature that is connected in parallel with the field windings which are shunted as well. The same voltage supply is provided because of the parallel connection.

2.2 Air Blower:

An aerator is a type of machine that is used to generate airflow at sufficient pressure. The airflow generated is used for various purposes such as blowers, vacuum cleaners, air condition, etc. for cleaning small cars. Depending on the needs, the airflow and pressure can be changed by the engine speed. The air blower has two main parts that are Impeller and housing.

2.3 Frame:

A frame is a structure that is used to resist the moments generated during loading and unloading. A frame is the first part or we can say that it is the base of any device on which other components are fixed to develop a working machine.

2.4 Suction chamber:

A suction chamber in a vacuum is that cavity/part of the machine from where the air is sucked inside the chamber due to the air pressure difference, leaves, dirt, and other kinds of stuff that need to be cleaned go through inlet suction chamber and enters the housing.

2.5 Wheels:

Wheels are circular blocks that rotate on its center axis and are attached to the machine to make it easily movable from one place to another. The wheels that we used here are the pneumatic wheels. Pneumatic wheels are those which instead of being solid from inside are filled with air.

2.6 Bag:

The bag can be either of plastic that can hold a large number of leaves and able to carry that much of weight, cloth bag can also be used but there are chances of faster decomposing as the leaves carry some moisture also.

2.7 screws:

A set of screws, nut, and bolts and also some rivets are used for the construction of the machine and to hold the parts on their places.

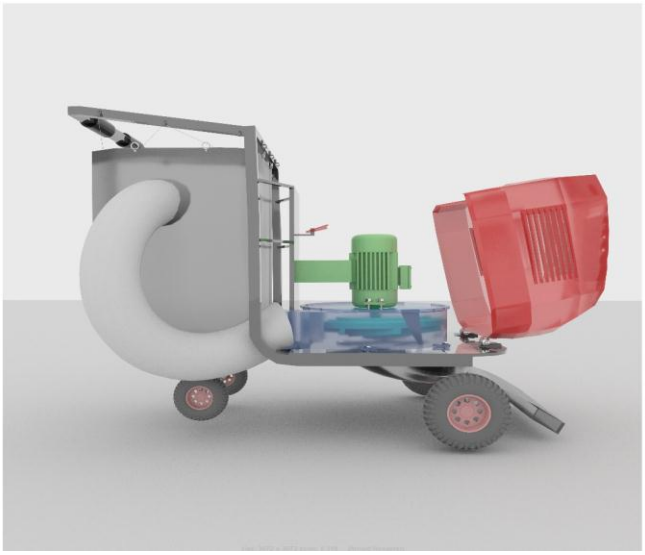
3. METHODOLOGY

3.1 Product description

- Voltage 230V
- Frequency 50Hz
- Input power 2000-2600W
- No load speed 5000-13000rpm
- Wind volume 13m^3/min
- Wind Speed 240km/h
- Shredder ratio 10:1
- Collection capacity 45L

3.2 Working

Garden and lawn vacuums cleaner are bigger and more rugged than the indoor vacuum cleaner. But where the home vacuums are used to clean dirt, dust, picking up several types of tiny materials, the lawn and garden cleaners are used to deal with large amounts of leaves. As a result, the material which is used for the construction of lawn vacuums is more strong and rugged, but the working of both outdoor and indoor vacuums are the same. At the center of the vacuum cleaner, an impeller is used which gets its rotating motion through an electric motor or a gasoline engine. Then there's the housing of the impeller is connected to exhaust and intake hoses. At the time fan stars to spin pressure inside the housing decreases as the impeller throw out all the air from the exhaust hose. A low-pressure area (partial vacuum) is left behind in the compartment. When air enters through the suction tube to fill this area and leaves this airflow, like the flow of water, suction is created. Leaves entered the housing get in contact with the impeller and are chopped into small particles (machines which use impeller as a chopper for leaves are known as mulcher) and then enter the carry bag through exit pipe. Then these mulched leaves can be used as fertilizers or what they can be used for.



4. PROJECT SCOPE

Leaf Sweeper machines can be made totally operator less thereby making it work with no manual power. The undesired collision can be prevented with the help of transducer and I.R. sensors. For making the machine more efficient solar panel can be used to charge the battery by the use of renewable energy.

4.1 Applications

1. To obtain hygienic surface leaf Sweeper machine is used in the hospital for both wet and dry cleaning.
2. Roadside - Leaf Sweeper machines are used in Cleaning of the road surface.
3. In colleges, it is used to clean the leaves which are collected on the road.
4. On the roads of the railway workshop, it can be used in any season.
5. It can be widely used in the industrial sector.

4.2 ADVANTAGES

1. Due to the electric work system, this leaf sweeper machine reduces the human effort in the cleaning of the surface. Compact design and easy to operate.
2. We are using the motorized brushes and mop in this machine cleaning work can be done faster. This will reduce the operating time
3. With the help of this machine, we can clean the dust and dirt and as well as at the same time.
4. As we are using the low voltage electric dc motor the power consumption is less. Fuel is not required
5. Low Maintenance cost is requiring.
6. In this machine, the controlling valve is used for Easy control of the cleaning solution.
7. Excluding the rough surfaces, it can be used on others.
8. The movement and the drive can be automated using some modifications.

4.3 DISADVANTAGES

1. When used on rough floors or rough surfaces leaf Sweeper machine produces vibrations
2. Leaf Sweeper machine can operate only on flat surfaces.
3. This machine is bulky and heavy to lift.
4. Stair of any building cannot clean by this machine.
5. Slow in operation as compared to an automatic machine.

5. CONCLUSION

With the use of this new technology, we can reduce machine costs significantly and reduces the manual power and can increase the value of road cleaning. This means road cleaning is more frequent which supports healthy well-being and an increase in overall cleanliness. The machine is a priority over

machines that are bulky, heavy and cannot be used for narrow roads. It is much more cost-efficient as compared to other machines in terms of both running cost and production cost. The eco-friendly manually operated leaf sweeper machine can work more effectively and efficiently to cost, an area covered, and time required for cleaning road as compared with the already available machines and it is economical. Machine cleaning is less effective where the road damaged and very rough.

REFERENCES

1. LEAF SWEEPER Inventor: Jerry C. Estes, Sr., 107 McCullouchRd., Louisville, Miss. 39339 Patent Number: 5,054,151

2. Vacuum type leaf sweeper: Joseph F. Joy, Pittsburgh, Pa., assignor to Joy Manufacturing Congary, Pittsburgh, Pa., a corporation of Pennsylvania, Application January 7, 1949, Serial No. 69,235

3. Design and development law cost manually operated machine, Volume: 06 Issue: 06 | June 2019, e-ISSN: 2395-0056, p-ISSN: 2395-0072

4. Muhammad Kashif Shaikh Ghaffar: Design and development of floor cleaning machine, e-ISSN (O): 2348-4470, p-ISSN (P): 2348-6406

5. Qingliang Yang: Study on Cleaning Performance of Small Road Sweeper Vehicle, 3rd International Conference on Electrical, Automation and Mechanical Engineering (EAME 2018)

6. Design and Fabrication of Multipurpose Eco-Friendly Cleaning Machine, ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887, Volume 6 Issue V, May 2018

7. https://www.bestgardenoutdoor.com/walk-behind-leaf-vacuum-mulcher/

8. https://www.leafblowersdirect.com/lawn/walk-behind-lawn-vacuums.html

9. https://www.leafblowersdirect.com/Little-Wonder-9160-02-01- Leaf-Blower/p9238.html

10. https://www.fresh-group.com/leaf-clearing-equipment.html