

Design and Fabrication of Multipurpose Automated Floor Cleaner

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Abstract - The process of cleaning means to make the surface neat, shiny and free from dust and various dirt particles. This process might look easy but it consists of collection of dust then dripping cleaning solution and after that cleaning with the help of mop. This single process requires different cleaning materials like broom, mop, cleaning solution tub etc. Moreover, it also requires manual hard work due to which most of the people suffers through back pain and various other problem. So, it is the need of today's life to find an alternative way of cleaning which lightens us with the idea of "AUTOMATIC CLEANER". Automatic cleaner will be the device which will collect the dust, drip the cleaning solution and at the same time it will also do the Moping operation. Not only cleaning the tiles this device would be designed in such a way that it would also clean the edges of wall.

Index Terms - Vacuum Cleaner, Tile Cleaner, Dripping mechanism.

I. INTRODUCTION

The process of cleaning means to make the surface neat, shiny and free from dust and various dirt particles. This process might look easy but it consists of collection of dust then dripping cleaning solution and after that cleaning with the help of mop. This single process requires different cleaning materials like broom, mop, detergent tub etc. Moreover, it also requires manual work due to which most of the people suffers through back pain and various other problem. So, it is the need of today's life to find an alternative way of cleaning which lightens us with the idea of "AUTOMATIC CLEANER".

Automatic cleaner will be the device which will collect the dust, drip the cleaning solution and at the same time it will also do the Moping operation. Not only cleaning the tiles this device would be designed in such a way that it would also clean the edges of wall. Such type of machine takes the cleaning concept to the next level.

Future of such type of project and concept is that it can be modified and make available at wide ranges such as Railway platforms, shopping malls, Cinema halls, Hotels and many more places spreading the idea of cleanliness and opening new field of interest for Engineers to make more new advancements and innovation. Moreover, this type of device can also be used in factory areas where garbage is producing continuously in large amount which will also reduce the efforts of workers to collect it and save their valuable time. This device is so convenient that even a small child can operate it and do the cleaning operation. This device also allows elders and handicap persons to do the cleaning operation just by sitting in one place.

Public places like Bus stands and Airports are long enough where such type of device finds wide application. If we employ four to five such devices, it will perform cleaning activity very effectively at very low cost. Whereas single worker for cleaning operation charges 10 to 12 thousand rupees per month and its calculation on yearly basis costs 144000₹ per worker whereas this device will be required maintenance which would be less than 5000₹ approx. Concept of our project is based on this two equipment's the Vacuum cleaner and the Mop. This equipment's works in a sequence, first vacuum cleaner is employed and after that the mop.

But in our machine optimizes the process by collecting the dust and the dirt at the same time.

Human effort is less in our concept compare to that equipment's and it is easy to operate.

In our device some modification is done by us. Our machine also cleans the side walls. By rotating side arms of mop.

II. METHODOLOGY

Every machine requires base before mounting different accessories on it. So, construction of

Automatic cleaner was also started with its base. Base was made with help of Plywood, Ball wheels, and Robot wheels. Initially we cut the plywood (31cm x 36cm) in size. Since, we decided to make robot wheels as rear wheels we marked the accurate position of the robot wheels. Then we attached the wheels with the help of nails. Front wheels are ball wheels which are also attached with the help of nails at respected position. In this way base of the project is made.

There are many different accessories of Automatic cleaner like vacuum cleaner which requires additional container for collection of dust then water dripping mechanism which requires flexible pipes, flow controller and container for storage of cleaning agent and tile cleaner which occupies very few spaces of base. Making of this accessory was scheduled and distributed among the team mates and as per schedule we first made vacuum cleaner.

MAKING OF VACUUM CLEANER: -

Main components of vacuum cleaner were suction blades and DC motor. Initially designing of blades was done on AutoCAD and as per CAD design we started cutting of the material. Material selected for manufacturing of blade was tin. Tin was obtained by perfume bottles. Initially bottles were cut with the help of hacksaw and marking of blades as per the dimension was done with the help of rounder and after that blade were cut with scissors. Blades were tilted to the inclination of 45 degrees as suction is possible to this angle. Further blade was attached to the DC motor which rotates at speed more than 25000rpm. Minor modifications were required during the process. In this way suction blades were manufactured. This blade was need to be fitted into suction chamber. Now suction chamber was made of PVC pipe front portion of pipe was made taper by attaching taper portion of bottle. Which was connected to the pipe from where dust was collected. Inside of suction pipe small slot is made which connects the dirt collection chamber and hence, dirt collect by pipe is transferred to the dirt chamber. Suction blades are attached at rear portion of pipe. In between suction blade and vacuum chamber fiber cloth is attached so that dust particles would not travel towards suction blade. Attachment of all these parts were done by hot glue gun. This vacuum cleaner was attached at the center of the base. In this way vacuum was manufactured.

MAKING OF TILE CLEANER: -

As per the schedule tile cleaner was the second part. Main component of tile cleaner was sponge, disc and DC motor. Similarly, like vacuum cleaner CAD designing of tile cleaner was done and as per the available material sponge was attached to the disc and disc in turn was attached to the motor. Four PVC pipes equal in diameter were cut in equal length. Every pipe was cut in U shape on any one side. Two pipes are connected on T joint and T joint is mounted on base. The other two pipes are attached in such a way that motor, sponge and disc assembly can rotate in both horizontal and vertical direction. Horizontal direction provides cleaning of wall edges whereas vertical direction of pipe provides cleaning of tiles. Two DC motors are used each does the tile cleaning operation at 1000rpm. Motors works on 12 v of power supply which is provided by 12v 1.3 A battery. In this way Tile cleaner is manufactured.

MAKING OF WATER DRIPPING MECHANISM: -

Main component of water dripping mechanism is flow controller. For making of water dripping mechanism, we made use of plastic container to store the water. We made holes at the bottom of the container to which pipes were attached from where water travels towards tiles. Flow controller is mounted in between of the pipes so that only required amount of fluid may travel. Container is mounted on the frame at a particular height so that water would flow with the help of gravity. At the top of container water cap is mounted from where refilling of water can be done. Water container in this model can store water of about 120 ml. In this way water dripping mechanism is manufactured.

WIRING: -

Wiring means connecting all the parts and make a single unit. For these main components were switch and battery. Positive terminal of different accessories is connected are connected to upper terminal of switch whereas negative terminal of battery is connected to lower terminal of the switch. Now remaining terminal of battery i.e. positive is connected to the negative terminal of the accessories and hence circuit gets completed. In this way wiring of the project is done.

CONNECTION OF THE CIRCUIT: -

We used two RC Circuit one act as receiver and other act as transformer on receiver there is a three terminals first terminal is used to first motor and second terminal is used main connection in this terminal is connected to the battery and the last terminal is connected to the second motor both the motors are controlling by transformer on the transformer four button two buttons for one motor same as second upper button is used to move forward the direction of machine and back two button for reverse direction.

III. COMPONENTS

1. CASTOR WHEEL: -



Fig-1

These ball wheels contain a spherical metal or nylon ball positioned within a holder. The ball has 360° of freedom and is normally used to balance a robot. In Automatic cleaner castor wheel's function is to provide direction to the mechanism and is also use to steer the whole cleaner in any direction.

2. DC MOTORS FOR WHEELS: -



Fig-2

This is a 12V 5 kg-cm 30rpm DC motor assembled with the wheels for the motion of the cleaner. This is a low rpm and high torque motor so that it can carry whole weight of cleaner. Two such motors were attached to the rear wheels of the cleaner.

3. MOTOR FOR VACUUM: -



Fig-3

To create the suction pressure at the head of vacuum motor with 12V 0.36 kg-cm 25000rpm is used. This motor was attached to the blade of cleaner to create the required suction pressure.

4. BATTERY: -



Fig-5

The function of a battery in cleaner was to provide power to various motors in the cleaner, RC circuit. This battery was 12V 5 Ah/20h rechargeable battery.

5. RC CIRCUIT: -

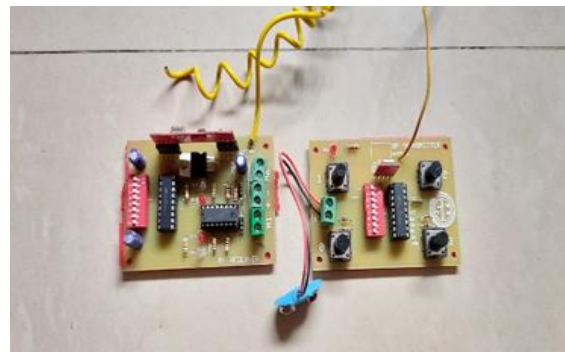


Fig-5

Function of RC circuit was to control the cleaner with the help of wireless remote within the range of 5-10 m.

IV. WORKING



Fig-6

Dust from the floor is collected with the help of suction created at vacuum cleaner. In order to store this dust a separate dust collector is attached in the mechanism. After collection of dust dripping mechanism is actuated the function of dripping mechanism is to drip the water in controlled amount on the floor. This quantity of water is controlled with the help of I.V circuit. After dripping mechanism tile cleaner is actuated, the function of tile cleaner is to clean the tiles or floor with the help of water dripped by dripping mechanism. Along with the floor automatic cleaner is designed in such a way that it can also clean the edges of the wall.



fig-7

The device is guided by RC circuit and direction is provided with the help of wheels and castor wheel.

V. FUTURE ADVANCEMENT

FOR DOMESTIC PURPOSE: -

We can make this device completely Automatic by using sensors which will also reduce the effort of operating it. Also, we can provide additional container at the top which can be used to transport small household things from one place to another.

FOR PUBLIC PLACES: -

We can provide camera to this device which can provide 360 degree of security which can be mostly used in offices and private sectors.

Future scope of such type of device is such that it strongly supports the "MAKE IN INDIA" concept of our Prime minister Narendra Modi sir which will help to complete his vision of clean and green India. Such concept also opens the new opportunity for engineers and creates new field of investment to become an entrepreneur.

Today government of India is also investing and motivating such concepts of cleaning as cleaning has become one of the most important issue in India. Clean places, clean air also improves the efficiency of human being and also provides better shelter to animals. Cleanliness also reduces the spread of diseases which makes the land one of the best places to live.

The waste materials obtained by cleaning are also recycled (e.g., Plastic, Metals etc.) which saves the useful resources of nature and became eco-friendly. Such small device shows such a wide advantage to Environment, human being and animals. This wide scope describes need of Automatic Cleaner in today's world

VI. CONCLUSION

- With an objective to create a compact cleaning device, 0.5Lx0.3Wx0.25H m is the size of automatic cleaner which is considerably smaller in size compare to other products available in the market.
- The total manufacturing cost of cleaner is around 3500-4000 Rs, the cost can be further lowered if we go for mass production.
- Since battery of cleaner is rechargeable the cleaner can be operated in case of power failure without any inconvenience.
- Automatic cleaner reduces human effort and also problems such as knee pain, lower back pain and such related health issues.

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