

Cleaning And Scrap Collecting Vehicle

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Abstract—Cleaning is the main basic need for all human beings and it is necessary for daily routine process. The conventional road cleaning machine is most widely used in many applications such as example roads, railway stations, airports, hospitals, Bus stands, in multi floor buildings, colleges etc. also this machine uses human energy for its working operation. In our project we are aimed to use easily available materials with low cost and it can be easily fabricated and easy to use and control. It is the better alternative for conventional machine.

Index Terms—Cleaning, Scrubbers, Vacuum cleaner, Brush Speed amplification mechanism, DC motors, Collecting Tank, Steering wheel Arrangement

1 INTRODUCTION

In recent years, cleanliness is becoming an important factor for betterment of nation. To support to cause we have conducted a study, prepare a design and working of road cleaning vehicle. Effective cleaning and sanitizing helps and protect the health of the human beings directly and indirectly. In recent years, most of the people prefer to use trains or buses for commuting and hence these places are littered with biscuits covers, cold drink bottles etc. Hence, it is necessary to clean the bus stands and railways stations at regular interval. There is no one single cleaning method that is suitable for all locations and occasions and effective cleaning depends upon type of cleaning device, cleaning technique and also the equipment should be user friendly. However in India, unemployment is more and hence there is a need to develop less labour oriented cleaning machine.

Cleaning machine is approach to deliver easy in time efficient cleaning of roads, by reducing human efforts.

The basic idea to generate machine which works on basic principle of physics, using mechanical, automobile component and devices. This device is help to clean roads in minimum time.

2. Problem Statement

Now, workers are hired to do this stuff but it is impossible to work continuously for workers. So this is time consuming and also costly process because of workers salary. The important factor is eliminating traffic problem because of less manpower as well as accident. Therefore we decided to design and develop such a machine that reduce the human efforts and save the time.

The running cost of machine is low and initial cost of machine is covered by saving of workers salary.

3. Aims and Objectives

- To develop a machine that helps in easy and quick cleaning.
- To Remove the dust from road by the use of scrubber which is rotate by using wheel motion and it collect into collection tank.

- To Provide the alternative method for road cleaning.
- To reduce the human effort and save the time.
- To reduce the cost of machine.
- To make environment sanitary.

4. Scope

- Design and fabrication is high efficient in minimum cost.
- This machine is very useful to cleaning road by the machine and its road cleaner rate is more as compared to the manually cleaning the road.
- This vehicle can be modified according to Indian road condition.
- Existing road cleaning methods are two types 1) Electrical operated, 2) Manually operated.
- Manually cleaning may causes shoulder problem due to continuous sweeping. Electrical operated road cleaners uses electrical energy to run the motor in our project manually operated road cleaning machine is alternative concept for avoiding such problems. It works very efficiently with respect to covering area. It is very economical to use.
- It can be automated using sensors and electrical circuits.

5. Methodology

During the survey we came across the points that the available road cleaning machines that are in use cannot clean the floor and compact roads effectively, like in collages, companies, hospitals, and household purposes. Thus for this an alternative method is essential. To overcome these disadvantages a simple and eco-friendly design is made. this machine is feasible to use for the household purposes and compact spaces.

According to precious research the conventional road cleaning systems are costly and heavy that cannot clean most of the rough spaces. The alternative method that is used to overcome this drawback effectively. The system uses simple DC motors, brushes, scrubbers, rotary broomers, wipers, as well as vacuum cleaners for the cleaning purpose.

During the literature survey we found that the various road cleaning machines, trucks, and other devices have some drawback, so we made the modifications according to the road

conditions and the purpose of use. The modified system uses mechanical drives for power transmissions as well as gear drives and chain drives. The scrubbers and broomers are rotated with help of chain drive that gets the motion from the wheels. This makes the machine pollution free and easy to use. Steering mechanism is used can steer front wheels upto maximum 60 degree with the verticle. The mechanism is based on lever principal in which input force is amplified to provide maximum output. The steering system goes the same as used in regular vehicles.

Selection of the different parts of the system is taken from various research papers available. In that we selected the various parts according to our design. In these papers the basic design is taken from one of the previous research papers. The design consist of four wheels and steering mechanism for its operation. The different component that re use in designing are brushes, scrubbers, rotary broomers, vacuum cleaners, battery, DC motors, chain drive mechanism.

6. Salient Points Of Literature Survey

1. Manual cleaning is time consuming so, by using manually operated road cleaning machine we can save time.
2. It was seen from literature survey that cleaning is less effective where the road seems to be very rough and damage.
3. Maintenance of machine is less and it is easy to control and clean.
4. Vacuum, Brushes, Vipers, Mobs, Scrubbers, etc. from these can be use to make the design economical and conventional.
5. Further modification in the vehicle can be made automated using sensors and electrical circuits.
6. The vehicle can be modified according to the Indian road conditions and where it needs to be used.
7. Manual cleaning is time consuming so, by using manually operated road cleaning machine we can save time.
8. It was seen from literature survey that cleaning is less effective where the road seems to be very rough and damage.
9. Maintenance of machine is less and it is easy to control and clean.
10. Vacuum, Brushes, Vipers, Mobs, Scrubbers, etc. from these can be use to make the design economical and conventional.
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12. The vehicle can be modified according to the Indian road conditions and where it needs to be used.

7. Components

7.1 Brush

The cleaning brush is located at outside of the machine and it is mounted on the shaft which is rotated with the help of chain and sprocket unit. The main work of the brush is to push the Garbage into storage tank.



Fig. 1. Brush

7.2 Gear pair

Spur gears or straight-cut gears are the simplest type of gear. They consist of a cylinder or disk with teeth projecting radially. Though the teeth are not straight-sided the edge of each tooth is straight and aligned parallel to the axis of rotation. These gears mesh together correctly only if fitted to shafts.

7.3 Scrubber

The engine is running at 300rpm so also Scrubber is rotated at same rpm or speed. The scrubber is actually in contact with dust, dirt beside the road divider. Diameter of scrubber is 8 inch, nylon material is used.



Fig. 2. Scrubber

7.4 DC Motor

Specifications-
Manufacturer- In-horse DC Motor, Model- MTP-P25-1JK40
1/6 HP (0.166)
12V
1732 rpm

7.5 Vacuum Specification

Dimensions - (415*415*440)mm
Weight - (6 kg)
Suction of motor - 2000 mm/wc (19600 pa)
Blower efficiency - 30 lit/sec
Noise - less than 88 dB
Power - 1200w
Voltage - 230v, 50Hz

7.6 Speed amplification Mechanism

Practically near about 40 to 50 RPM speed is required for

brush to collect or push the dust which is removed by the scrubber into the dust storage box and hence it is essential to rotate the brush at this speed. It is possible to get this speed. If we go with the only arrangement of pair of gear but it requires larger size of gear and pinion which may lead to weight of setup hence we decided to rotate this brush into two stages.

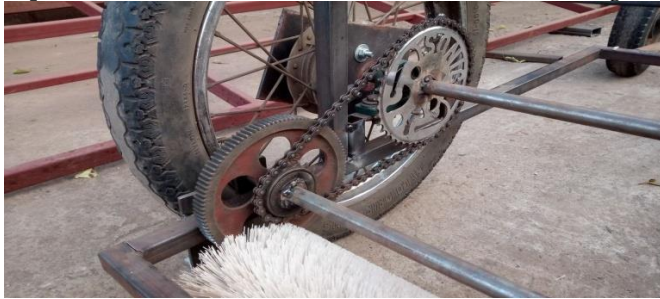


Fig. 3 Speed Amplification Mechanism

7.7 Steering Mechanism

This steering mechanism can steer the front wheels up to 60 degrees with the vertical and for doing this small amount of force is required. This mechanism is based on the lever principle in which input force is amplified to provide maximum output. When driver rotates the handle anticlockwise the arms moves to left side which moves z strips and finally wheel gets turn to left side and vice versa.



Fig. 4 Steering Mechanism

8. Construction and working

In this section we are presenting our modified design. Based on the grounds of our previous literature survey. In this design we added the one more rotary brush on either sides of the vehicle. To make more efficient cleaning. The previous design doesnot consist the front and rear scrubbers, so the cleaning in between the two brushes is remain the same. So, with the help of this scrubber the complete span of the vehicle body and sides are covered. Front and rear scrubbers are rotated with the help of the motor and gear pairs.

For the rotation of the scrubbers we have two provisions - 1) DC power supply, 2) Gear Drives. The machine also uses the vacuum cleaner for the suction of the minute dust particles which spread in surrounding.

Frame Specifications (Approx.)-

Length-107 cm

Width-76 cm

Height-92 cm

Weight-40 kg

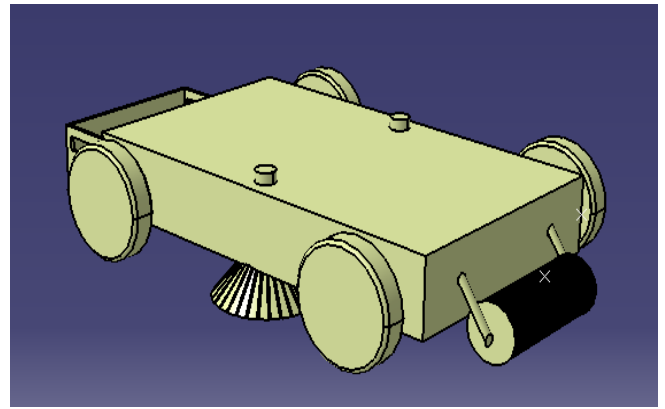


Fig.5 Isometric View

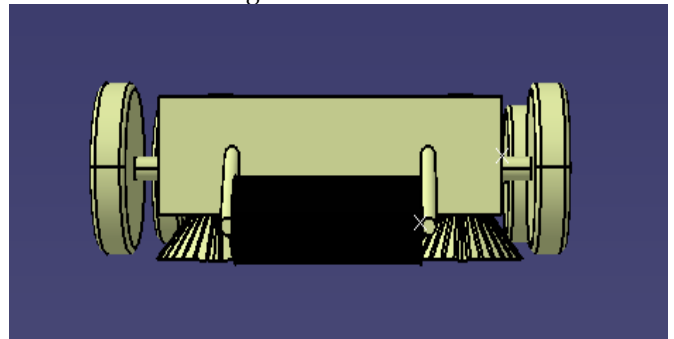


Fig.6 Front View

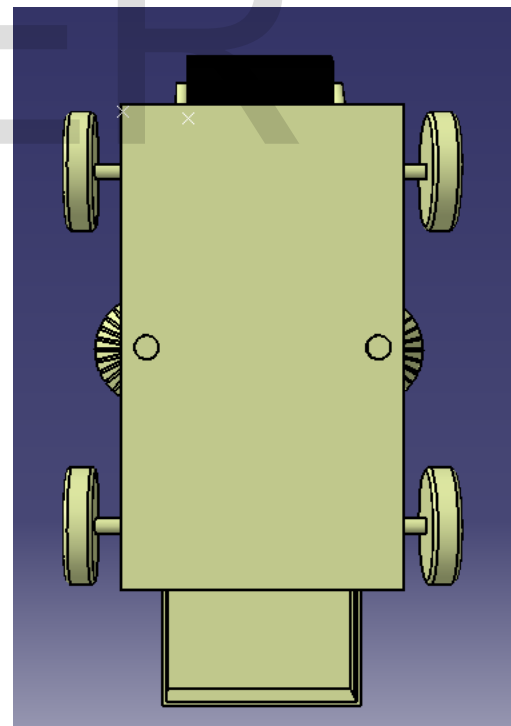


Fig.7 Top View



Fig.7 Actual Model

9. Advantages And Disadvantages

9.1 Advantages

- Manual efforts are reduced.
- Operation time is less.
- Less power consumption.
- Low maintenance cost.
- Ease of control.

9.2 Disadvantages

- It not capable to clean stairs of buildings.

- It is semi-automated machine.
- Less effective where roads seems to be rough and damaged.
- Heavy to lift.

10. CONCLUSION

Concluding remarks and scope for future

A mechanical setup is designed with synergies of pneumatics and mechanical systems to provide efficient cleaning, both at floor and the road surfaces. This project implements the manually operated eco-friendly road cleaner for road cleaning that reducing the cost, human efforts as well as time. It is the best alternative for automated road cleaning machine during power crisis. It is found that the existing road cleaning machines uses petrol and diesel. It can cause pollution and also the vibration produced in the machine causes noise pollution. The machine is economical. Manual cleaning may cause shoulder problem due to continuous sweeping. The simple mechanisms employed in this system makes the vehicle easier for operation.

The modified model that is present in report can be optimized as much as possible. The changes that can be made of

- Chassis can be built on PVC polymer that will reduce overall weight of system.
- The system can be made automated by using PLC and Sensors.
- The system can also be fully automated without manual interventions.

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