

Eco-Friendly Road Cleaner (Semi Automatic)

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ABSTRACT:The multipurpose road and floor cleaning machine has a wide range of applications. It can be used on all kind of roads in rural as well as the urban. Working on the basic principle of mechanical design. This project deals with the designing and fabrication of Floor cleaning Machine. The aim of this project work is to develop manual process and solar energy for cleaning the floor with motors and brush. It is very useful for cleaning the floors and rough roads. It can be used dry condition for proper cleaning, use old simple mechanism and designed to be portable and weight less to carry anywhere hence it is widely used in houses, hospitals, auditorium, shops, computer centers, etc. To overcome the rising issues of cleanliness in India the road cleaner can play a vital role. The cleaner solves the problem of dusty roads, removal of metal particles from road. our motive is to present a detailed qualitative study of cleaning system using the cleaner, the main focus being cleanliness with minimum utilization of resources available with us.

KEYWORDS:Semi Automatic, Eco-Friendly Road Cleaner, Motors, Solar Energy.

I. INTRODUCTION

Good sanitization and cleaning leads to proper health of human beings. It directly effects the environment and the surrounding. In recent years cleanliness is becoming an important factor for the betterment of the nation and so, to support the cause we have conducted a study, prepared a design and working of an Road Cleaner.

road cleaner is very much useful in cleaning streets etc; it is very simple in construction and easy to operate. Anybody can operate this machine easily. The time taken for cleaning is very less and the cost is also very less. Maintenance cost is less. Much

type of machines is widely used for this purpose. But they are working under different principles and the cost is also very high. The cleaner is an approach to deliver easy and time efficient cleaning of roads, by reducing human efforts.

In our project is very simple drive mechanism and easy to operate any persons. The size of the machine is also portable, so we can transfer from one place to other place very easily.

In development of the field cleanliness one can find a number of research papers and studies, but this paper deals with study of various components which function in different ways in order to clean the environment and provide an eco-friendly, clean surrounding. This cleanliness can be achieved by utilizing all the functions of the road cleaner to the optimum level. The basic idea is to generate a machine which works on basic principles of physics, using mechanical components and devices. Making an assembly of the components and ultimately creating a machine which can be the answer to various cleaning issues in a single unit.

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
- designed to be less weight and portable.
- manually operated cleaning with the help of vehicle movement

- use of gear system improves the stable movement of the vehicle
- specifically designed brush for this project for better cleaning
- Removes the dust from roads effectively
- Cleaning of roads by round drum brush structures for proper cleaning.

II. LITERATURE REVIEW

M Ranjit Kumar and N Kapilan[1] The conventional floor cleaning machines is most widely used in airport platforms, railway platforms, hospitals, bus stands, and malls and in many other commercial places. These devices need an electrical energy for its operation and not user friendly. In India, especially in summer, there is power crisis and most of the floor cleaning machine is not used effectively due to this problem, particularly in bus stands. In this work, modeling and analysis of the floor cleaning machine was done using suitable commercially available software. From the finite element analysis, we observe that the stress level in the manually operated floor cleaning machine is within the safe limit.

Prathmesh Joshi, Akshay Malviya & Priya Soni[2] This project report is based on the "Manually Driven Platform Cleaning Machine" which serves the basic needs of cleaning large floors.

Ritvik Ghosh, H R Vinay Kumar, Dattatraya, Pavan Kumar B. Hiremath, Prof. Pradeep Kumar[3] This paper elaborates the design and fabrication of a floor cleaner which runs purely on mechanical power and also has the capability of being ridden at low speeds by the user. The mechanism used to drive the cleaning mechanism would be similar to the one used in a spinning mop commonly known as a 'magic mop'. The mechanism works using a bevel gear system wherein high speed multiplications can be obtained using the right gear specifications. The input to the system would be in the form a foot-pedal accessible to the user.

Sandeep J. Meshram & Dr G.D. Mehta[4] This paper presents the design and fabrication of Tricycle operated street cleaning machine with the related search. At present we have few automated machines which are foreign made and can be used in our country. This basically instigates to think for an alternative mechanism called Street cleaning process.

Manreet Kaur & Preeti Abrol[5] Manual work is taken over the robot technology and many of the related robot appliances are being used extensively also. Here represents the technology that proposed the working of robot for Floor cleaning. This floor cleaner robot can work in any of two modes i.e. "Automatic and Manual".



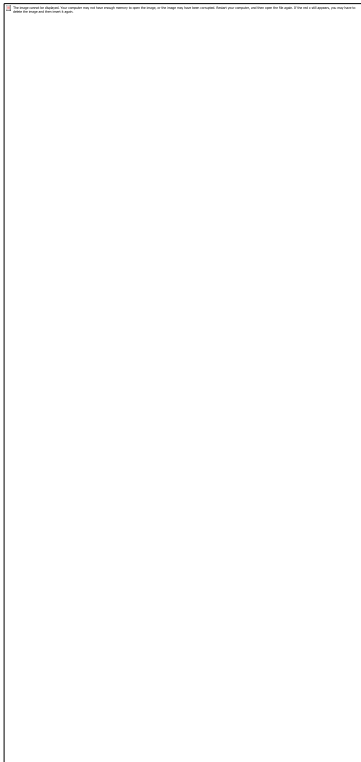
III. PROBLEM STATEMENT

The major problem which India faces is cleanliness. The problem we came across was cleanliness on roads, pathways, lanes, highways, railway stations airports etc. The dust and dirt on the road as well as metal and other pieces on the road are a problem for the humans. It is harmful for human race as well as the vehicles running on the road. Dust and dirt causes asthma and other

respiratory problems. On the other hand metal particles and other abrasive particles are harmful for tires of vehicles. The main feature would be cost efficiency as the cost to make the machine is very less as compared to other cleaners available in the market. Another major problem in India is load shedding and most of the cleaners are electrically operated. So to overcome this problem we are using the battery system which can be recharged when electricity is available and work as and when

required. We also looked over a fact that we should not totally remove employment so such a machine is designed which will remove the waste to the sides of the road. This waste can then be cleaned by the sweepers and ultimate cleanliness can be achieved. Apart from this the choked manholes and sewer pipes can be cleaned by the multipurpose road cleaning machine

IV. METHODOLOGY



- I. Literature study Make review on other model and focusing on how to make it simple and relevance to the project title.
- II. Conceptual design Sketching several type of design based on concept that being choose. State the dimension for all part.
- III. Materials Selection Selected the true material based on model design and criteria. Light, easy to joining and easy to manufacture. Assemble all the part to the design.
- IV. Fabrication model refinement. Fabricate according to the main frame and design. Refinement at several part of joining and sharp edge.
- V. Performance testing.
- VI. Documentation Preparing a report for the project.

WORKING PRINCIPLE

Eco friendly road cleaning machine is an advanced type of machine used for the roads or streets. The detail working of the Eco friendly road cleaning machine is explained below. Eco friendly road cleaning machine we are making without using any power supply, fuels and engines. The machine is run by a human effort or a man power. The system is fixed with pair of wheels which are connected with the help of shaft. The shaft makes the wheels connected to one and other. The wheels are moved for a desired position with a help of manual force which can handle is provided to move. The handle can be adjusted for a required height and provided three adjusting holes for it. A chain drive is connected to the wheels and gear at both sides. The chain is moved according to the wheel and gear. The brush moving opposite direction of the wheels move and the brush brooms the waste present on the road also it dumps the waste into the waste collecting box. The waste collecting box is removed to dump the waste into desired places.

BRUSH



The cleaning brush is located at outside of the machine situated on the front side of the vehicle 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. Purpose of the brushes is to extract the dirt and waste from the road and broom it aside cleaning the road. For this purpose we have used pvc brushes which can remove dust and dirt from the road. drum brushes have a long life and can also easily clean out wastes.

NUT AND BOLT



A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten two or more parts

together. The two partners are kept together by a combination of their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together. In applications where vibration or rotation may work a nut loose, various locking mechanisms may be employed: lock washers, jam nuts, specialist adhesive thread-locking fluid such as Loctite, safety pins (split pins) or lockwire in conjunction with castellated nuts, nylon inserts (Nyloc nut), or slightly oval-shaped threads. The most common shape is hexagonal, for similar reasons as the bolt head - 6 sides give a good granularity of angles for a tool to approach from (good in tight spots), but more (and smaller) corners would be vulnerable to being rounded off. It takes only 1/6th of a rotation to obtain the next side of the hexagon and grip is optimal. However polygons with more than 6 sides do not give the requisite grip and polygons with fewer than 6 sides take more time to be given a complete rotation. Other specialized shapes exist for certain needs, such as wingnuts for finger adjustment and captive nuts

**DESIGN AND CALCULATION
 BASIC SHAFT DESIGN FORMULA**

The drive shaft with multiple pulleys experience two kinds of stresses, bending stress and shear stress. The maximum bending stress generated at the outer most fiber of the shaft. And on the other hand, the shear stress is generated at the inner most fiber. Also, the value of maximum bending stress is much more than the shear stress. So, the design of the shaft will be based on the maximum bending stress and will be driven by the following formula:

$$\text{Maximum bending stress } T_b = (M * r) / I \dots \dots \dots \text{Eqn.1.1}$$

Where,

- M is maximum bending moment on the shaft.
- r is the radius of the shaft.
- I is area moment of inertia of the shaft.

Design Procedure

- " Draw the bending moment diagram to find out the maximum bending moment (M) on the shaft.
- " Calculate the area moment of inertia (I) for the shaft.
- " Replace the maximum bending stress (T_b) with the given allowable stress for the shaft material.
- " Calculate the radius of the shaft.

Shaft Design Problem

Refer the above picture, where a steel shaft is supported by two bearings and a pulley is placed in between the bearings. You have to design the shaft. Weight of the pulley is 1000 N.

Input data:

Maximum allowable shear stress for the shaft material= 40 N/mm²

Solution:

" From the bending moment diagram, the maximum bending moment (M) is calculated as 66666.67 N/mm².

" Area moment of inertia (I) of the circular shaft is:

$$I = \pi * r^4 * 0.25 = 0.785 * r^4 \dots \dots \dots \text{Eqn. 1.2}$$

" From Eqn.1.1 we can write:

$$40 = (66666.67 * r) / (0.785 * r^4)$$

$$r = 7.15 \text{ mm}$$

" So, the minimum radius of the shaft should be 7.15 or dia 14.3 mm.

WELDING AND FINISHING

• **ARC WELD**

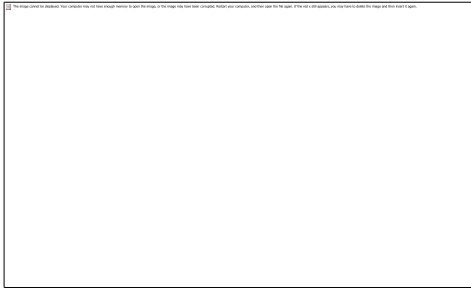


Arc welding is a process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals. It is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated. First developed in the late part of the 19th century, arc welding became commercially important in shipbuilding during the Second World War. Today it remains an important process for the fabrication of steel structures and vehicles.

• **ARC WELD EQUIPMENTS**

Welding is the joining of metals through coalescence by the use of either heat or pressure or both. Coalescence is a term that means the joining

of two materials to become as one piece. The basic arc welder components consist of the machine that generates the power, the electrode holder or wire feed gun, a means of shielding the weld as it forms, and protective equipment for the user. The process begins in all types when the wire or rod makes contact with the piece to be welded.



- This completes an electric circuit and creates an arc through which the transfer of the metal from the wire or rod to the piece is facilitated. Spatter occurs during transfer; some of the molten drops of metal become airborne and cover the piece and surrounding area with small globules that solidify on cooling. Spatter may be minimized depending on the skill of the operator and the welding method being used.

CORROSION PREVENTION

The following methods are used for corrosion prevention of the various components of the Multipurpose sowing machine.

RUST CLEANING

Oxidation creates a scale formation on the surface of the material. Scale formation gives rough structure of surface of iron oxide. This iron oxide formation penetrates into the surface and makes the metal weak and reduces the life of the components. Different grades of emery sheets are used to remove the rust formed on the surface of the steel and cleaned properly.

RED OXIDE COATING

This Red Oxide Paint Coating is to prevent the action of corrosion and protect the Surface of the components from atmospheric corrosion. Red Oxide Paint and Thinner liquid are mixed in proper proportion and coated on the surface of the components. The purpose of thinner is to reduce the viscosity of the paint and free flow of the paint over the surface of the components.

FINISH COATING

Milky white color paint is applied over the surface of the machine after the application of the above coatings in a smooth manner using a paint sprayer. This final finish coating of the milky white color of the paint gives good pleasing appearance and effective corrosion prevention.

Components	SPECIFICATIONS
Frame	1 inch square pipe
Shaft	15mm mild steel
bushes	50mm thick 15mm
brush	pvc brush 20 inch diameter 250mm
Wheels	Rubber wheel 24 inch dia
Ball bearings	HSS inner dia 15mm outer dia 40mm

Chain and sprocket	HSS
washers	Mid steel bore 15mm step 60mm
Rotating wheel	pvc
Sheet metal	Mild steel 18 guage

ADVANTAGE,APPLICATION AND LIMITATION

ADVANTAGES

- Manual effort is reduced.
- effective cleaning
- Power consumption is less.
- Design is very simple.
- Easy fabrication.
- Brush occupies largecleaning area.
- Net weight is less.
- Maintenance cost less.
- It can be used in various floors.
- Smoother operation.
- By further modification the drive or movement can be made automatic.

APPLICATIONS

- Domestic purpose.
- Hospitals.
- Computer centers.
- Auditoriums.
- Cultural centers.
- Schools.
- Colleges.
- Large scale industries.
- Medium scale industries.
- Theatres.
- Educational institutions.

LIMITATIONS

- Vibrations will be produced when used on rough floors or surfaces.

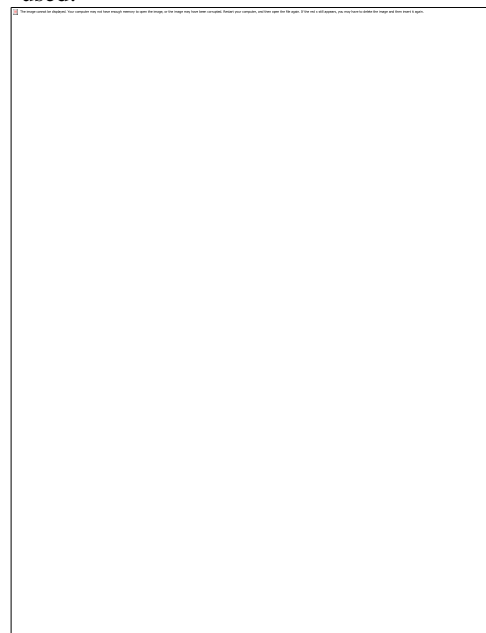
V. RESULT AND FUTURE SCOPE

RESULT

It Remove the dust from road by the use of scrubber which is rotate by using wheel motion and it collect into collection tank. From the above literature review of different authors weconclude that pedaling mechanism can be used in different machine and it is better to use human energy instead of using fuel consuming machines.

FUTURE SCOPE

- Vacuum, Brushes, Vipers, Mobs, Scrubbers, etc. from these can be use to make the design economical and conventional.
- Further modification in the vehicle can be made automated using sensors and electrical circuits.
- The vehicle can be modified according to the Indian road conditions and where it needs to be used.



VI. CONCLUSION

Based on the above study we came to know that because of the ever increasing energy crisis we have to switch to manual mode, one of which is Human Power because of reasons such as availability of labours and does not require skilled operator to run the vehicle. Manual cleaning is time consuming so, by using manually operated road cleaning machine we can save time. Maintenance

of machine is less and it is easy to control and clean. In this review paper we have studied evaluation, fabrication and performance of road cleaning machine and came to know the different parameters like its efficiency, application, future scope of work, cost and ergonomic designs.

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