Design and Manufacturing of ECO-Friendly Road Sweeper Machine

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ABSTRACT

This paper presents the design and development of eco-friendly road sweeper machine, in our country various types of electrically operated sweeping machine is available in the market but the cost of this equipment are high. So these machines are not used in small spaces like college area, industrial area or hospital area. In this project an efforts has been made to develop a mechanically operated eco-friendly road sweeping machine so that it can be used for small space cleaning without pollution. Onother hand in rural area the road cleaning is done by an manual operated which can be hazards to health like asthma, bronchitis etc to the worker. the cost of mechanically operated sweeping machine is less as compare to electric operated sweeping machine and the machine is economical and comfortable for operating in rural area and it is suitable on smallspaces, it is eco-friendly to user.

Keyword : - *Road cleaner, Human powered, Roller brush, Pedal axle, Eco-Friendly Dust collector etc…*

1. Introduction

Cleaning has become a basic need for all human beings and it is unavoidable daily routine process. The conventional road cleaning machine is most widely used in railway stations, airports, hospitals, Bus stands, etc. also this machine needs electrical energy for its operation. It is not user friendly as well as eco-friendly. In summer time there is power crisis and most of the roads cleaning machines are not used effectively due to this problem particularly. In our project we are using easily available materials with low cost. It is the better alternative for conventional Machine Cleaning work can be physically demanding and a need has been identified to developed methods for systematic ergonomic evaluation of new products. In recent years, floor cleaning robots are getting more popular for busy and aging populations due to lack of workers. However in India, unemployment is more and hence there is a need to develop less labor oriented cleaning machine.

In recent years, conventional floor cleaning machines are most widely used in airports, railway stations, malls, hospitals and in many commercial places, as cleaning is one of the important parameter for the sanitation and government regulations. For maintaining such places, cleaning the floor is the major task which is necessary. There are conventional floor cleaning machines available to perform floor cleaning operations in above said places. Generally a conventional floor cleaning machines requires electrical energy for its operation. In India, especially in summer there is power crisis, in majority of places. Hence cleaning the floor using the conventional floor cleaning machines is difficult without electricity. In this project an effort has been made to develop a manually operated floor cleaning machine so that it can be an alternative for conventional floor cleaning machines during power crisis. A manually operated floor cleaning is developed with major list of objectives, one; to achieve simultaneous dry and wet cleaning in a single run, secondly to make the machine cost effective and thirdly to reduce the maintenance cost of the manually operated floor cleaning machine as far as possible.

2. Literature Review

In India, road is cleaned by hand using different handmade instruments. Initially itwas washed by different reed brushes. According to Egyptian houses were built of sundried mud bricks at times white- washed and the roads were stamped earth. The road of the outdoor kitchen too was simply the ground baked stone hard by thesun. Unless it was raining, whichhappened only rarely, these roads were easy to keep clean by sweeping.

Nowadays, India is very fast developing country. The major profit of makingorganization of India is Indian Road Transport. There is still a lot of efforts are implemented to clean the road for its maintenance. Also, some people are irresponsible. They through garbage,wrappers, plastic bottles, waste on roads. So, it is very necessary to remove waste from road.

3. Methodology

1. Market Analysis to identify problems andrequirements.
2. Selection of suitable fabrication materials.
3. Concept design of structure.
4. Analysis of design and optimization.
5. Start of production and fabrication.
6. Testing and evaluation of overall performance.
7. Incorporating necessary modifications
8. Presentation and report formation.

3.1 PARAMETERS CONSIDER TO DEVELOP MANUALLY OPERAED ECO FRIENDLY SWEEPING MACHINE

1. **1. Shaft (Axle):** Axle is used for mounting sprocket and wheels. We use three axle first axle is used for transmission power, second axle is used for mounting sweeper brush, and third axle is used for mounting supporting wheels.

   Mild steel material is selected for an axle due to mild steel has a resistance to breakage. Mild steel, as opposed to higher carbon steels, is quite malleable, even when cold this means it has high tensile and impact strength higher carbon steels usually shatter or crack under stress, while mild steel bends or deforms. In some designs, this allows independent suspension of the left and right wheels, and therefore a smoother ride. Even when the suspension is not independent, split axles permit the use of a differential, allowing theleft and right drive wheels to be driven atdifferent speeds as the automobile turns, improving traction and extending tire life.

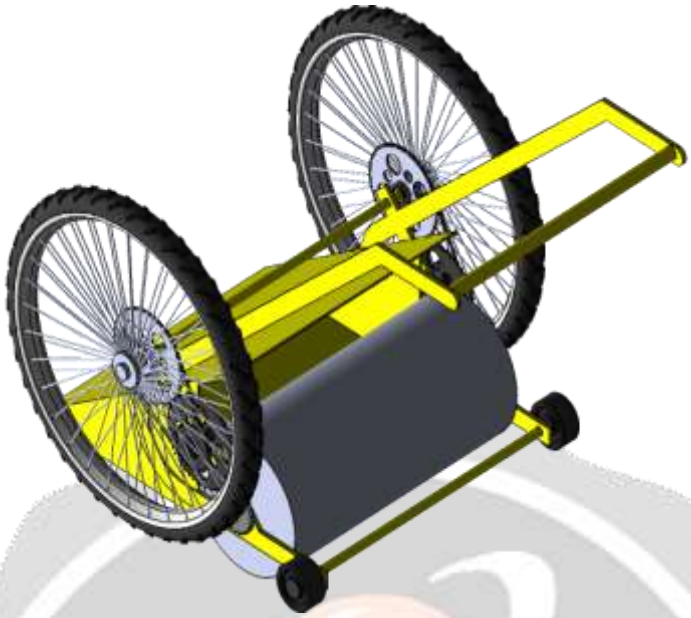
Fig.1 Axle.

2. Wheel: A wheel is a circular block of a hard and durable material at whose center has been bored a circular hole through which is placed an axle bearing about which the wheel rotates when a moment is applied by gravity or torque to the wheel about its axis, thereby making together one of the six simple machines. When placed vertically under a load-bearing platform or case, the wheel turning on the horizontal axle makes it possible to transport heavy loads; when placed horizontally, the wheel turningon its vertical axle makes it possible to control the spinning motion used to shape materials.

Fig.2 Wheels

Table - 3.2 Technical specification of sweeping Machine

Parameters	**Specifications**
Sprocket material	Stainless steel
Axle material	Mild steel
Sweeper material	Polypropylene / plastic
Frame material	steel
Gear ratio	1:5
Chain	Alloy steel
Shaft (Axle)	20mm



3.3 Description

- It cleans the surface as well as catches all unwanted material from road.
- It is a tricycle operated system we have given motion to sweeper using chain drive mechanism.
- After main shaft secondary chain used to rotate secondary axle which are directly connected to sweeper axle.
- Third axle also connected to system whichhas cotton brush which clean surface.
- For properly working of sweeper addition of new shaft.
- Addition chine drive in both side used to increase gear ratio.
- Addition of two wheel in back side of machine for giving support to frame

4. Scope of Work

- Cleaning of railway station.
- Cleaning of bus stand.
- Cleaning of road surface.
- Cleaning of college area.
- It can be widely used in industrial sector.

Advantages

- Maintenance cost is less
- Compact design
- Easy to operate
- Fuel is not required
- Pollution less

Disadvantages

- Human effort is required
- Slow in operation as compare to electric

Road sweeper machine

- It runs only in plane surface

5. CONCLUSION

This design of eco-friendly road cleaning system can be used to clean any kind of remote places. As the chain mechanism selected can consume much less power so it will be the power saving and cost saving as well. Also, there is a need of a brush which operates automatically. As well as provides new add on of sanitization of road. Successfully designed, analyzed and fabricated. This project works 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. While manual cleaning may cause healthy problem as the person directly comes in contact with dust. Also, the shoulder problem due to continuously sweeping occurs. A manually operated eco-friendly road cleaner is an alternative concept for avoiding such problems. The manually operated eco-friendly road cleaner can work very efficiently with respect to covering area, time and cost of road cleaning process compared with the existing machineries. Also it is economical. It was seen while testing of machine, that the cleaning is less effective where the road seems to be very rough and damaged.

6. REFERENCES

[1]. https://en.wikipedia.org/wiki/Bevel_gear
[2]. https://www.sciencedirect.com/science/article/abs/pii/S0304394019300916
[3].https://khkgears.net/new/gear_knowledge/gear_technical_reference/calculation gear_dimensi ons.html
[4]. http://www.bloodjournal.org/content/75/8/1711.short