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DESIGN & DEVELOPMEMT OF LOW COST MANUALLY OPERATED SWEEPING MACHINE

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Abstract - This paper presents the design and development of mechanically operated sweeping 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 this 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 sweeping machine so that it can be an alternative for small space cleaning. On other hand in rural area the road cleaning is done by an manual operated which renders fatigue hazards 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 small spaces, it is eco-friendly to user.

***Key Words*: Road cleaner, Human powered, Roller brush, Pedal axle, Eco-Friendly Dust collector.**

1.INTRODUCTION

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. Cleaning work can be physically demanding and a need has been identified to developed methods for systematic ergonomics 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. Hence, the present work is aimed to design, development and evaluation of a manually operated floor 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.

Literature Review

Mohsen Azadbakht et al 2014 [1] - "Design and fabrication of a tractor powered leaves collector machine equipped with suction-blower system**"**

M. Ranjith Kumar et al 2015 [2] - "Design and Analysis of Manually Operated Floor Cleaning Machine"

Sandeep J. Meshram et al 2016 [3] - "Design and Development of Tricycle Operated Street Cleaning Machine"

Liu et al 2013 [4] – "A Technical Analysis of Autonomous Floor Cleaning Robots Based on US Granted Patents,**"**

1.1 Objective

1.To design and develop road cleaning machine capable of cleaning road as well as around space.
2.To make machine operate manually so that it does not require any power supply.
3.To make the machine economical.

1.2 Methodology

1. Market Analysis to identify problems and requirements.
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.

2. PARAMETERS CONSIDER TO DEVELOP LOW COST MANUALLY OPERAED SWEEPING MACHINE

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 the left and right drive wheels to be driven at different speeds as the automobile turns, improving traction and extending tire life.

2. **Chain Drive:** A chain drive consists of on endless chain running around two sprocket wheel the chain drive have a features which are common to both the gear drives and belt drives. Chain drives are a means of transmitting power like gears, shafts and belt drives. Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycle and motorcycle. It is also used in a wide variety of machines besides vehicles. Drive belts can slip unless they have teeth, which means that the output side may not rotate at a precise speed, and some work gets lost to the friction of the belt as it bends around the pulleys. Wear on rubber or plastic belts and their teeth is often easier to observe, and chains wear out faster than belts if not properly lubricated.

Table -2.1: Technical specification of sweeping machine

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

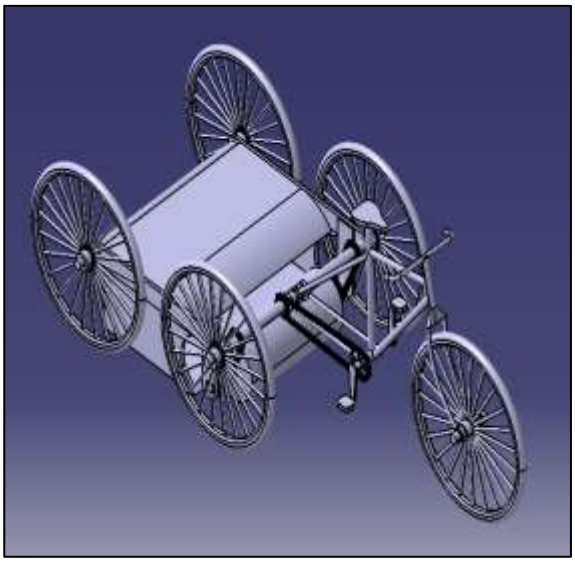

Fig.2.1 CAD model of sweeping machine

Description

- Manually operated sweeper machine is eco-friendly as well as simple in construction and easy to work

- 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 which has 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

3. Project scope

- 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

- Maintainance 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 automatic machine
- It runs only in plane surface

4. CONCLUSION

It is found that the existing street 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 health problem as the person directly comes in contact with dust. Also, the shoulder problem due to continuously sweeping occurs. A tricycle operated street cleaning machine seems an alternative concept for avoiding such problems enlisted in first point.

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