

Design and Fabrication of Brooming Machine

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Abstract— The aim of this paper is to presents the design and fabrication of brooming machine which is used for road side cleaning. The related search shows at present we have very few automated machines which are manufactured in foreign (which makes it costly), the truth of the matter is that these machines are structured keeping as a primary concern that foreign street condition. Here, in India, the conditions are altogether different. In the rural region, the street cleaning is finished by a manual activity which renders weakness and hazards like asthma, to the labourer. This essentially instigates to think for an optional mechanism for the Road cleaning process. The machineries available in our market is bulky and expensive. In developing country like India, it can't be afforded everywhere (rural regions) so the concept of making this project is to reduce the cost as well as size of the machine so that mobility can be increased.

Keywords— *Brooming Machine, road side cleaning, rural region.*

I. INTRODUCTION

The current situation with the road cleaning process is depicted below. There is two way for road cleaning 1) Manual procedure 2) Machinated process. In the manual procedure, the road cleaning is with the assistance of scoop to wipe off the flotsam and, squander and so on. An individual consistently completes a swiping activity by the hand to clean the road by spreading the residue all over around. While in the Machinated procedure, a vehicle containing sweeper at base persistently pivoting, clean the road just as sucks the tidies spread by the turning floor brush

A road clearing individual would utilize a floor brush and scoop to wipe off waste and rottenness that aggregated on roads. Afterward, water hoses were utilized to wash the lanes. Machines were made in the nineteenth century to carry out the responsibility all the more proficiently. Today, present day road sweepers are mounted on truck bodies and can vacuum trash that collects in roads. If one carefully observes the process, then he could find the following limitations which are given below

Present cleaning process renders fatigue to the hand and even it causes damage to the shoulder.

As it is a continuous process, it produces mental fatigue and hazardous to the health of sweeper.

II. LITERATURE REVIEW

K. AISHWARYA PARDESHI ET AL

"Programmed Floor Cleaner". In this undertaking she infers that the setup of equipment with a mix of programming gives better precision and lessens the outstanding task at hand. Labour is limited. It has Ease. It is a Tedious Gadget Making a little machine brings an adaptability to do work

IMAEKHAI LAWRENCE ET AL

"Assessing Single Circle Floor Cleaners" - The assessment has demonstrated how the utilization of numerous appraisal procedures can give a complete examination of the plan, convenience and musculoskeletal stacking upon the administrator. They proposed that the preliminaries with a bigger number of subjects would surely reinforce the ends.

ABHISHEK CHAKRA BORTY ET AL

"Plan of Residue Gatherer for Back Wheel of Four-Wheeler" – They detailed that the most noteworthy reason for street dust to the all-out suspended particulate weight is vehicle voyaging on cleared and unpaved' surfaces. Therefore, information legitimately relating residue to street mishaps are uncommon, however in study if dust is the reason for 10% of these mishaps losses then the expense could add up to as much as 0.02% of Gross domestic product in a few creating nations and aggregate about \$800 million every year

MANYA JAIN ET AL

"Modified Floor More clean". This examination energizes capable ground cleaning. the Floor cleaner is united with different contraptions like DC motor(s). so it will be anything other than hard to manage it besides saves time and will work normally for cleaning reason at homes and working environments. With clear estimation and program, the cleaner will in all likelihood spread extensive floor regions similarly as find its bearing into and out of little corners. As the cleaner crosses the room, the sweeper

presented in it will make sense of how to get a basic proportion of soil. Manual Clearing most likely won't be that amazing as it won't get everything in as it isn't in sight anyway using the customized floor cleaner it might be done viably. This examination energizes beneficial floor cleaning. Since in endeavour the floor cleaner is united with assorted contraptions like DC motor(s), ultrasonic sensors, etc., so it will be anything besides hard to manage it in like manner saves time and will work normally for cleaning reason at homes and working environments. With direct figuring and program, the cleaner will be fit to cover immense floor districts similarly as find its way into and out of little corners. As the cleaner crosses the room, the sweeper presented in it will make sense of how to get a basic proportion of earth. Manual Clearing most likely won't be that suitable as it won't get everything

III. METHODOLOGY

In this project the different mechanism which are used are as follows

1. Roller mechanism
2. Belt and pulley mechanism
3. Conveyer belt mechanism

1) Roller mechanism

In our project a broomer is connected to a roller which is operated with the help of electric motor. The rolling force help the dust particles to move to the collector the lighter particles are directly connected to the secondary collector and the heavier particles are transfer to the conveyer belt and they are transfer to the primary collector

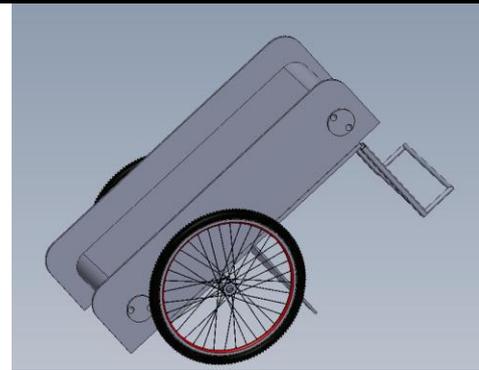
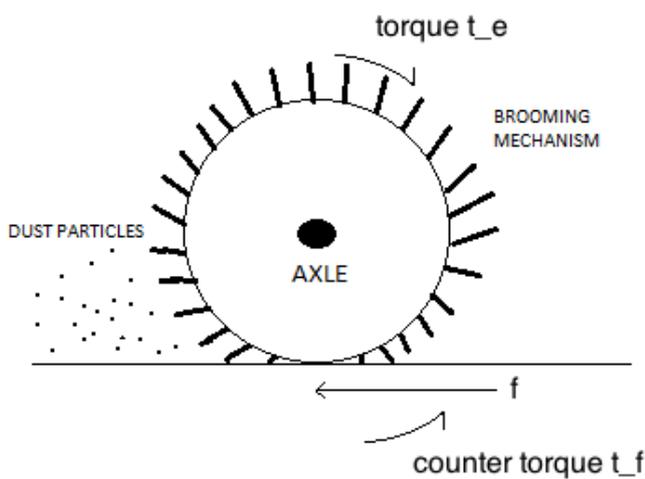


Fig.1: Brooming Mechanism

The broomer brushes are in directly contact with the dust particles when the roller rotates the force experienced by the roller is in forward direction hence it applies force on the dust particles in backward direction which is governed by the newton third law. The brushes are also in compression while they are in contact with the ground so when they are released, they exert an upward thrust on the dust Particles which help them to be collected in the dust collector chamber.

2) Belt and pulley

Our project uses cross belt mechanism to drive broomer and conveyer belt. the power is directly transferred to the broomer via spur gear with the gear ratio . Then a belt and pulley arrangement transfer the power to the conveyor belt and conveyor pulley is connected to the secondary collecting chamber. The pulleys are of 5 inch and 1.5 inch respectively made up of cast iron and belt are of 8mm dia made up of nylon

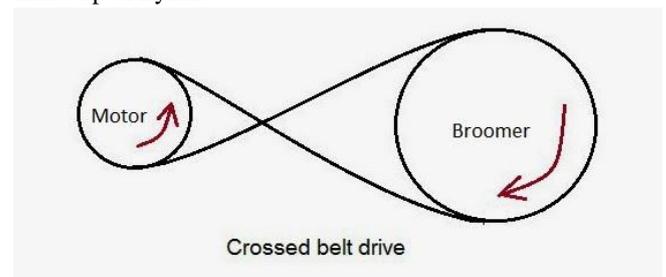


Fig.2: Belt and Pulley Drive

Cross belt create less noise and it help in smooth power transmission. there is no requirement of lubricant in cross belt .in cross belt drive the direction of rotation is opposite to each other.

3) Conveyer belt mechanism

Our project uses conveyer belt mechanism which help in collecting the major dust particle and transfer to the collecting chamber. Conveyer belt rotate with the help of cross belt drive which is operated by electric motor () uses spur gear mechanism for power transmission. Conveyer having strip which help to support the major dust particle to move along with the conveyer and collect in the collecting chamber.

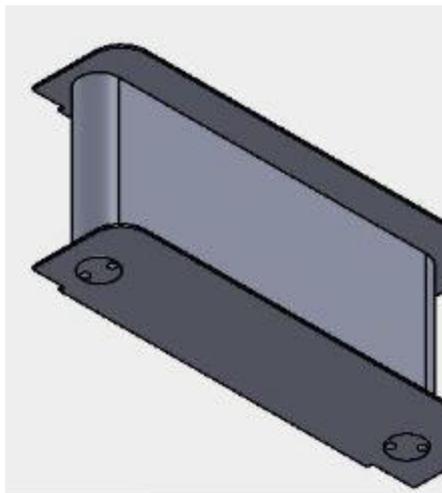
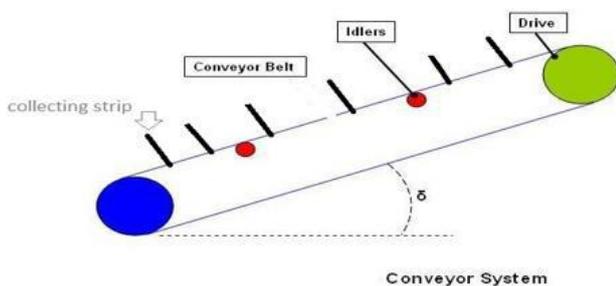


Fig.3: Conveyors

Conveyor belt are inclined so that dust easily collect in the collecting chamber. Belt are made up of – and rotate with the speed of -

Component used

1) FRAME

Frame is a basic structure of brooming machine and made up of mild steel with the help of arc welding. The dimension of frame is 48*22 inches. Frame help in supporting the belt drive also help in absorption of shock and vibration. Brommer is also attached with the frame which help in providing the strength to the brooming machine.



Fig.4: Frame

2) BALL BEARING

Ball bearing is used to reduce the rotational friction between the two-rolling element (inner and outer) and it also support radial and axial load. the size of ball bearing is 10mm (inner diameter)



Fig.5: Ball bearing

3) SPUR GEAR

Spur gear is used for speed reduction. In our machine Spur gear is made up of cast iron Two different size of spur gear is being used in our brimming machine of diameter 2 inch and 5 inch respectively. It helps in power transmission from motor to conveyor. Number of teeth on the small gear is 32 and on the larger gear is 85 and the gear ratio is 2.61



Fig.6: Spur gear

4) BELT AND PULLEY

The pulley we used to support the movement of belt and also help in changing the direction of the belt. It also helps in transfer the power between shaft and belt.

We used two pulleys of different diameter (5 and 1.5 inch). Pulley is made up of cast iron.

Belt is made up of nylon which has 8 mm diameter.



Fig.7: Pulley

5) MOTOR

Motor having specification are as follows-

- Voltage and current specification of motor is 220V,2A
- Maximum rated speed of motor is 9500 rpm
- Power output of the dc motor is 400W



Fig.8: DC motor

6) BROOMER

Broomer used for the collecting the dust particles from the ground and transfer the particle to the conveyor and then from conveyor to the collecting chamber. Broomer having sharp edges tooth made up of fibre that help to stuck the dust particle. Broomer is mounted on the hallow pipe which is made up of PVC and its diameter is 4 inch and it is connected with pulley



Fig.9: Broomer

Table of component

S.No.	COMPONENT USED	SPECIFICATION	QUANTITY
1	FRAME	MS,48"X22",ARC WELDING,	1
2	BALL BEARING	10mm	2
3	SPUR GEAR	CI, 2" & 5" Dia	2
4	PULLEY	CI, 5" & 1.5" Dia	2
5	BELT	Nylon 8mm Dia	1
6	MOTOR	DC, 220V, 2A, 9500rpm,400W	1
7	REGULATOR	600W	1
8	ROD	SILVER STEEL, 10mm Dia	3
9	BROOMER	FIBRE, 4" Dia	1
10	CONVEYOR BELT	REXGIN 72"	1
11	TYRE	Tubeless 20" Dia	2

REFERENCES

- [1] Modak J. P. "Design and Development of Manually Energised Process Machines having relevance to

Village/ Agriculture and other Productive Operations" HUMAN POWER, International.

- [2] M. Ranjit Kumar and N. Kapilan, "Outline and Examination of physically worked floor cleaning machine," IJERT ISSN: 2278- 0181 Vol. 4 Issue 04, April-2015
- [3] M. Ranjit Kumar1 M. Tech Student, Mechanical Engineering, Nagarjuna College of Engineering and Technology, Bangalore, India. ISSN: 2278-0181 Vol. 4 Issue 04, April-2015
- [4] Sandeep. J. Meshram, Dr. G.D. Mehta - "Design and Development of Tricycle Operated Street Cleaning Machine" - Journal of Information, Knowledge and Research in Mechanical Engineering ISSN 0975 – 668X| Nov 15 To Oct 16 | Volume– 04, Issue- 01.
- [5] Prof. Dr. A. Muniaraj Professor, Department of Mechanical Engineering, Kings Engineering College, Chennai, Tamilnadu, India ISSN 2394-3777 (Print) ISSN 2394-3785.
- [6] Abhishek Chakraborty, Ashutosh Bansal – "Design of Dust Collector for Rear Wheel of Four-Wheeler" - International Journal of Emerging Technology and Advanced Engineering, Volume 3, Issue 7, July 2013, 199-216
- [7] Armas, K., & Moralde, D. (2019). Production Operations Management of Broom Reed Industry in the Philippines. *International Journal Of Advanced Engineering, Management And Science*, 5(1), 63-72. doi: 10.22161/ijaems.5.1.9