Automatic Gutter Cleaning Machine

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Abstract— Water is a basic necessity of humans & all living beings. There is plenty of water on earth but that is not suitable for human use. Clean water is more important if used for some purpose. The impurities is present in water can cause hazardous & disease. As long as the draining system is considered as the function of main drainage system is to collect, transport & disposed of the water through an outlet. Impurities in drainage water can be only like empty bottles, polythene bags, papers etc. this impurities present in drainage water can causes blockage or drainage system can be cleaned time to time manually or such a system can be designed that will automatically throughout wastage & will keep the water clean this project is designed to keep clean the drainage system and help the smooth working of the system. This project automatically cleans the water automatically clean the water in the drainage system is time any wastage appears and this form and efficient & easy way of cleaning the drainage system and preventing the blockage.

Keywords: Floating Garbage, Chain Wheel Drives, DC Motor, Tricycle Sprocket, Mild Steel Shaft, Lifting Pan

I. INTRODUCTION

Water is a basic necessity of humans and all living beings. There is a plenty of water on earth but that is not suitable for human use. Clean water is more important and is used for some purpose. The impurities present in water can cause hazardous diseases. Impurities in drainage water can be like empty bottles, polythene bags, papers etc. House drains emptied themselves into the main drains which ran under the main streets and below many lanes. Solid matters that are created by human or animal activities, and which are disposed because they are hazardous or useless are known as solid waste. Most of the solid wastes, like paper, plastic containers, bottles, cans, and even used cars and electronic goods are not biodegradable, which means they do not get broken down through inorganic or organic processes. Thus, when they accumulate they cause a health threat to people. Moreover, it also causes damage to terrestrial organisms while also reducing the uses of the land for other more useful purposes. Therefore, this problem needs immediate remedial measures. These impurities present in drainage water can cause blockage or the drainage system. The drainage system can be cleaned time to time manually or such a system can be designed that will automatically throw out wastages and will keep the water clean. This project is designed to keep clean the drainage system and helps the smooth working of the system. This project helps to clean water in the drainage system each time any wastage appears and this form an efficient and easy way of cleaning the drainage system and preventing the blockage. It also reduces human power and improves the quality of water that is cleaned. The drainage systems are cleaned when there is no water in them i.e. when it is not raining, but when it is raining the drainage systems cannot be cleaned because of the harsh conditions of the rain which no one would volunteer to ensure that garbage does not enter into the drainage system.

II. IDENTIFICATION OF PROBLEM

A study found that 80% of Drainage & Sewage cleaners in India die before age 60 because of work related health problems. A 2014 study by praxis India called "Down The Drain!" claimed that "about 100 workers die every year while entering the confined space at high temperatures in the presence of toxic gases, chemicals, and insects". People are still cleaning sewers by hand in this country and they're dying. Indian sewer workers, usually stripped down to their underwear rather than outfitted in protective gear, go down manholes and often spend their days neck deep in human muck using brooms, scrapers and buckets to clean blockages.

A. Calculations

SHAFT

– LENGTH (L)= 762 MM
– D = 25MM

D.C. MOTOR
VOLTAGE=12V
CURRENT=1.0-1.5 A
SPEED= 55RPM
LIFTER
LENGTH =457.2MM
Sprocket Wheel
No. of Teeth (n)=24 Bush
Length= 60 mm
Diameter=25.4 mm
Collecting bin
Length=900mm
Breadth=600mm
Height=300mm
AREA =270000mm^2
BATTERY
VOLTAGE =12V
AMP =1.6
WEIGHT=2.2 KG
LENGTH OF MODEL=1066.8 MM
HEIGHT OF MODEL =1219.2 MM
WIDTH OF MODEL =609.5 MM
INCLINATION TO BASE =45 DEGREE
FOR TORQUE
Electrical torque=V x I
=12 x 1.67
=20 WATT
NOW
P=2x3.14xNxT/60000
=3472.47 N-MM

We assumed the diameter of shaft to be 2.54 cm on the basis of capacity of wiper motor.

III. METHODOLOGY

The machine is place across a gutter so that only water flows through the lower side. Floating waste like bottles, plastic cans, covers…..etc. is lifted by lifting pan which are connected to the chain. The chain revolves with the sprocket wheel which is driven by the DC motor. The energy provided to the motor is electrical energy. When motor runs, the shaft starts to rotate then sprocket start rotating which also make chain to rotate and thus lifters rises up and the wastage material are lifted by lifter teeth and stored in collecting bin. Once the collecting bin is full, the waste materials are removed from the bin.

Concept of Project: The main concept of this project is to pick the floating waste particle from drain and dumps it into the collecting tank.

A. Material Selection

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The choice of the material for engineering purpose depends upon the following factors.

1) Availability of material.
2) Suitability of material for the working condition in service.
3) The cost of material.
4) Physical and chemical properties of material.
5) Mechanical properties of material.

Keeping in mind above of the all points we reached at the conclusion that for the project frame mild steel square pipe will be adequate.

Sr. No.	Part Name	Qty.	COST
1	Sprocket	4	300
2	Bush	4	200
3	Solid Shaft	2	500
4	DC Wiper Motor	1	1200
5	Battery	1	1200
6	Bearing	4	700
7	Chain Drive	2	280
8	Lifter	2	200
9	Collector Bin	1	450
10.	Square M.S. Bar	40 ft	1000
11	Net	1	300
	TOTAL		6330 /-

C. Construction and Working

1) Construction

Basically during construction of the model the basement part is prepared by welding the metal bars by electric welding. Then the supporting rods are welded at an angle of 90 degree from the basement, the pillow block bearings are fixed to the supporting rod and the front part of the basement. Cylindrical shafts are fixed to the bearings and also chain drive are also fixed to the shaft in order to fix the shafts the factor of safety of the chain is calculated. The two lifters are fixed to the chain by gas welding at an equal distance from each. Then the collecting bin is fixed at backside by welding.

2) Equipment Used

Sr.no.	Name of Equipment	Purpose
1	Bosch handheld Cutter	For cutting mildsteel pipes
2	Bosch handheld grinder	For grinding edges and protruding welds
3	Drill Machine	For drilling holes
4	Lathe Machine	For turning ofcenter shaft
5	Sand paper	To remove rustfrom the bars
6	Filler	Filling of different parts of the project
7	Arc Welding machine	For welding the base frame and other parts

Table 2: Equipment used

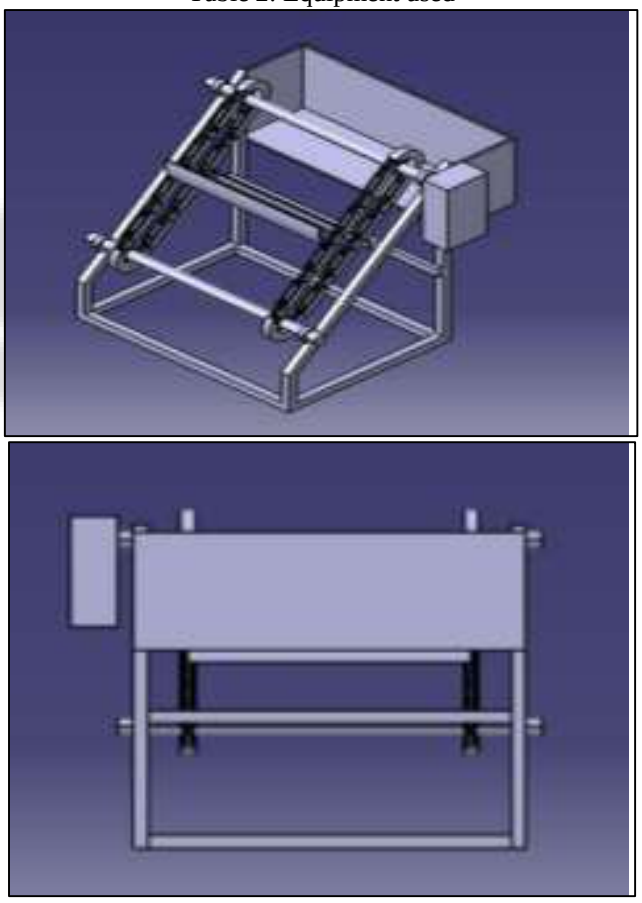

Fig. 1: Design of Machine

Fig. 2: Actual Model

3) Working

The drainage cleaning mechanism is used to takeout any floating or sub-floating particles by simply immersing the machine into the gutter system. Here the mechanism is placed into the drain in such a way that the lifter portion is placed against the flow of the gutter water. The bottom of the lifter is placed into the gutter whereas the collecting bin is fitted in top back side of machine. This set-up is possible with the help of a hinge which is placed between the collecting tank and the conveyor. From our literature surveys , it was found that the gutter system's actually does not have any standard dimensions; that is the width and the depth of the drains are varied according to the parallel road networks, eg: the size of a gutter in the urban areas will be much more larger than the drains in the rural areas. To meet these requirements we decided to make our machine 2 ft wide. The battery is mounted on a pole or a post which will be erected near to the mechanism.

Initially the mechanism is kept in the gutter system such that is faces against the flow of stream. As the waste particles floats toward the mechanism, it initially gets obstructed by the mesh provided on the lifter setup. During this instant the revolving forks picks up the waste particle and dumps it into the collecting tank provided behind the mechanism. The fork is attached to the two sets of chain drives which is driven by a 12V DC motor. If any waste particles flow by during the idle time of the motor, the particles will get accumulated in front of the mesh and during the next working cycle the forks will pick up these waste particles and transfer them into the collecting tank. By placing any type of plastic bags inside the collecting tank, we can collect the accumulated waste particles by simply pulling the lower frame of the collecting tank. The width and the depth of the drains will vary from one drain to the other, so to make the equipment more effective and usable in any gutter we can adjust the width and depth of the equipment with the help of telescopic mechanism. The system is a very efficient way to cleaning gutters & drains and also requires very low power since it will only rotate once or twice a day to dump the solid waste. The width is adjusted by simply loosening and tightening of screw nut, which are provided along the central axis of the conveyor mechanism. Thus by combining a mechanical and an electrically integrated system we obtain a mechanism that is very much efficient and effective in cleaning the waste particles from the drainage system.

IV. Scope of the Project

As the project has been based on the concept, to integrate the benefits for human health, societal concerns and national cleanliness policy. Therefore it covers many sections of proportionate benefits to the all sphere of our present life.

A. For Academics

Drainage Cleaning System is basically an agglomeration of the basic mechanical components that we have gone through regressively during out past four year of curriculum. All the basic components that majorly consist of the Chain drives, Bearings, Welding, Turbine etc. components are finely integrated to build to structurally simple project. • Moreover the last add on the project to give and edge effect harnessing of the flow energy of the drain gives the project the much needed future scope of exploitation of the renewable resource.

B. For Industry

Presently as a nation, India purposefully focus on two major things. Firstly as young and fast growing nation we are concentrating to pull out the maximum from our manufacturing sector with a touch of Start-ups as thing of sub-topic focus. Our Project, as being new in the market network will provide the entrepreneurs the much needed ideas to blend the technology with societal benefits and harness the market. • Secondly, as a nation we are focusing on the Public benefits in the policy making and providing the young generation the employment and environment safety. While being a high-market potential project conserves the profit for the industry section with the advance of providing the corporate social benefits.

C. For Society

In a modern society where luxury has become a necessity in the urban and rural hub, there lies a section of the population who still lives on meager just enough to satisfy its hand to mouth needs. Sanitations is one of the very basic amenities required for the basic living of a man and providing with such a technological and economical instrument which can change the pathetic sewerage condition of the town and cities of mediocre India. • With such a potential instrument of employment generation in the society through industry co-operation, these products land you in the win-situation for the people.

V. Conclusion

We can apply this project in remote and slum areas with effectiveness. Since drains are linked with hygiene and in slum areas this is major problem and we can apply this project in those areas and can safeguard health of the people. Our project is very useful in monsoon because in rainy season our drains are usually are overflowing and they can be blocked by solid wastes. We can incorporate this project with SWACCH BHARAT ABHIYAAN which is a revolution in

present times. We can say that in India our drains and sewage paths are open so this project or mechanism can become very handy and use to clean them.

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