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Drainage Cleaning Machine

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Abstract:

In this project the proposed concept is to replace the manual work in drainage cleaning by mechanical drain cleaner. Now-a-days even though mechanical drainage plays a vital role in all industrial applications in the proper disposal of sewages from industries and commercials are still a challenging task. while cleaning the blockages in the drainage system. To overcome this problem and to save human life we implement a design "mechanical semi-automatic drainage cleaning system" and we designed our project to use this in efficient way to control the disposal of wastages and with regular filtration of wastages. The Drainage system cleaner is a machine which helps to protect the environment from different kinds of environmental hazards through the promotion waste management by the removal of garbage from the drainage system. These wastes when not removed end up settling in residential places where these wastes are burnt thereby causing climate change otherwise these wastes block the drainage systems thereby causing flooding.

Keywords: Drainge, mechanical semi-automatic drainage cleaning system, filtration of wastages.

1. Introduction

Sewage is a water-carried waste, in solution or suspension,that is intended to be removed from a community. Also known as wastewater, it is more than 99% water and is characterized by volume or rate of flow, physical condition, chemical and toxic constituents, and the bacteriological organisms that it contains. It consists mostly of grey water (from sinks, tubs, showers, dish and clothes washers, and toilets) and the human waste that the toilets flush away; soaps and detergents; and toilet paper (less so in regions where bidets are widely used instead of paper). Whether it also contains surface run off depends on the design of its route back to the environment.

A basic distinction in its route is whether it is treated in any way to mitigate its effect on the environment before arriving there. Sewage usually travels from a building's plumbing either into a sewer, which will carry it elsewhere, or into an onsite sewage facility (of which there are many kinds). Whether it is combined with surface runoff in the sewer depends on the sewer design (sanitary sewer or combined sewer). Before the 20th century, sewers usually discharged into a body of water such as a stream, river, lake, bay, or ocean. In general, with passing decades and centuries, humanity seeks to be smarter about the route of sewage on its way back to the environment, in order to reduce environmental degradation and achieve sustainability. Thus other goals of modern sewage routing include handling surface runoff separately from sewage, handling grey water separately from toilet waste, and coping better with abnormal events (such as peaks in use from internal displacement and peaks in storm water volumes from extreme weather).

2. Disease potential

All categories of sewage are likely to carry pathogenic organisms that can transmit disease to humans and other animals; contain organic matter that can cause odor and nuisance problems; hold nutrients that may cause eutrophication of receiving water bodies; and can lead to ecotoxicity. Proper collection and safe, nuisance-free disposal of the liquid wastes of a community are legally recognized as a necessity in an urbanized, industrialized society.

Impurities in drainage water can be only like empty bottles, polythene bags, paper etc. 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.

3. Problem Statement

In today's era automation plays a very important role in all industrial applications for the proper disposal of sewage from industries and household is still a challenging task. Drain pipes are used for the adequate disposal of waste and unfortunately sometimes there may be a threat to human life during the cleaning of blockage in the drain pipes or it can cause serious health issues because of the pertaining problems like malaria,

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dengue, etc. In order to overcome this problem as well as to save human life we implement a design.

4. Working Principle

This unit is a assembly of the various parts in which the two set of chain sprockets held on two axles are connecting the chain, one drive axle and another driven axle, the drive axle coupled to the DC motor the chain holding the flap to take the debris or the suspended particles up through the chain drive and are dropped into the container provided at the backside of the machine.This entire assembly is held within rectangular pipes with the vertical frames and base frame which is holding four number of wheels which are held on the wheel axles which can be manually pushed ahead.

The vertical height of the machine will be approximately 1000mm and width will be 500mm and length will be 850mm. The top axle is holding two set of sprockets and bottom axle is holding two set of sprockets in alignment and the chain is connecting the sprockets and connecting rods are joined across the when reaching the top point as required. The debris collected in the collected bin, it can be lifted up or removed to be emptied and again placed in the machine.

Figure1: mechanical semi-automatic drainage cleaning system.

5. Manufacturing process of various parts involved in this system

a. **Main frame**: This is made out of mild steel tube of size 30x20mm cut for the length of 1170mm—2nos, ground at both the ends to remove the cutting burr and to make right angle, both are joined by tac welding and then marked for the holes drilling at the distance of 75mm from one side for first hole.

b. **Support frame**: This is made out of mild steel tube cut from the size of 20x30mm of length 250mm---2nos, 1040mm---2nos, 760mm—2nos, all are ground at the ends to remove the cutting burr and to make right angle and then marked for the end cutting in angle to join all three in the shape by arc welding as per the sketch and such two set are made and then these set are joined to the main frame to make the entire frame of the drainage machine.

c. **Main frame supports**: These are made out of mild steel tube cut from the size of 15x15mm of length 455mm---2nos, ground at the ends to remove the cutting burr and to make right angle and then joined to the main frame as required to support at the top portion and bottom portion.

d. **15mm ball bearing housings**: These are made out of mild steel round bar cut from the diameter of 50mm for the length of 20mm and then turned on lathe machine to make the diameter as 45mm and drilled for the diameter of 16mm and counter bore for the diameter of 35mm to suit the ball bearing outer diameter for the depth of 10mm and faced from the other side to make the total length as 15mm. such two number of ball bearing housings are made for this project.

e. **Ball bearings**: These are the standard roller type ball bearings of outer diameter 35mm, inner diameter 15mm, of thickness 10mm. such two number of ball bearings are used in this project.

f. **Driven axle**: This is made out of C30 steel round bar being cut from the diameter of 20mm of length 565mm and turned on lathe machine to make the diameter as 15mm to suit the ball bearing inner diameter for the entire length and then faced from both the sides to make the total length as 560mm as required.

g. **Drive axle**: This is made out of C30 steel round bar being cut from the diameter of 20mm of length 615mm and turned on lathe machine to make the diameter as 15mm to suit the ball bearing inner diameter for the entire length and then faced from both the sides to make the total length as 610mm as required.

h. **Sprocket bus**: These are made out of mild steel round bar of diameter 25mm of length

35mm---4nos and turned on lathe machine to make the diameter as 22mm to suit the sprocket inner diameter of 22mm for entire length and center hole drilled to make the hole diameter.

i. **Sprockets**: These are the standard sprockets made of C30 steel being used in automobile with hole diameter of 22mm and thickness of 10mm with diameter of 45mm with 10 number of teeths on it. Such four number of sprockets are used in this project which are mounted on bushes and used.

j. **Flap tray**: These are made out of mild steel flat and sheet, flat being cut from the size of 1.5mm x 8mm of length 545mm, hammered for flattening and then U shape bent with side legs of 100mm and straight portion at center as 345mm. on this frame perforated steel sheet of 1.5mm thick is cut for the size of 345x100mm, hammered for flattening and then welded on this frame and ground.

k. **Drive sprockets**: These are the standard sprockets made of C30 steel being used in bicycle with hole diameter of 35mm and thickness of 14mm with diameter of 75mm with 16 number of teeths on it. Such two number of sprockets are used in this project in which mild steel bush is made and plugged and welded and used in this project.

l. **Axle sprocket bush:** This is made out of mild steel round bar being cut from the diameter of 40mm of length 20mm and then turned on lathe machine to make the diameter as 35mm to suit the sprocket inner diameter for the length of 14mm drilled to make the hole diameter as 15mm to suit the axle diameter and then faced to make the total length as 14mm. this bush is then welded to the sprocket which makes the driven sprocket.

m. **Motor sprocket bush: T**his is made out of mild steel round bar being cut from the diameter 40mm cut for the length of 35mm and then turned on lathe machine to make the diameter 34mm to suit the sprocket inner diameter for the entire length and center drilled and bored to make 10mm hole to suit

n. **Motor holder**: This is made out of mild steel flat being cut from the size of 20mm x 3mm of length 235mm, hammered for flattening, such two number of flats are cut and hammered for flattening and then bent to make the circle with inner diameter to be 76mm to suit the motor holding in it and the ends are joined by arc welding. On the circumference marking is done and drilling

o. **Container base holder**: This is made out of mild steel flat cut from the size of 25x5mm of length 175mm---2set, hammered for flattening and marked for the bending at the distance of 140mm from one side and L bent to have the shape as per the sketch. such two set are made and welded on the main frame to be able to support the container holding at base.

p. **Battery holder**: This is made out of mild steel flat being cut from the size of 12mm x 3mm for the lengths of 360mm----1nos, 240mm----1nos and hammered for flattening and then marked for the bending to make rectangular shape out of 360mm flat for the outer size of 100mm x 80mm and then joined by arc welding and another flat is made in U shape with 70mm legs and 100mm straight and this is welded to the rectangular frame to make the box structure to hold the battery within it.

q. **Container top support**: These are made out of mild steel flat being cut from the size of 25x5mm of length 265mm---2set, hammered for flattening and marked for the bending at the distance of 40mm and another bend at the other side of 25mm as per the sketch and bend and aligned and used in this project.

r. **Container support arm**: This is made out of mild steel pipe cut from the size of 20x20mm of length 450mm, ground at both the ends to remove the cutting burr and to make right angle and used in this project as support arm.

s. **Transformer holder**: This is made out of mild steel flat being cut from the size of 20x5mm of length 105mm and hammered for flattening and then marked and drilled to have the holes of 5mm to suit the transformer holding at the distance of 15mm from one side and 70mm between centers. This is then welded on the chassis frame.

t. **Switch holder**: This is made out of mild steel flat being cut from the size of 20x5mm of length 45mm, hammered for flattening and then marked for the hole drilling at the distance of 10mm from one side to have 6mm hole and drilled and

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ground to remove the drilling burr and welded to the frame.

u. **Container base mesh**: This is made out of mild steel mesh being bought from the market with 20mm square mesh distance of size 260mm x 410mm and welded to the base of the container.

v. **Container**: This is made out of cold rolled closed annealed (CRCA) steel sheet of 1.5mm thick being cut for the size of 310mm x 1330mm, hammered for flattening and then marked for the bending to make the box structure as per the sketch and joined by arc welding at the ends to make the box. Then mesh is welded at the base to make it as a container.

w. **CRCA sheet cover**: This is made out of cold rolled closed annealed (CRCA) steel sheet of 1.5mm thick being cut for the size of 415mm x 850mm, hammered for flattening and then ends are bent to the small curve of 10R at both the ends and then joined to the main frame supports by arc welding to provide the base closure to the flap moving on the chain as required. [4]

x. **Motor for the drive**: This is a standard wiper motor which is used in the automobile which is having the cranking mechanism which is cut and converted to have the rotations, which works on 12 volts DC, 3amps and having 32 rpm --12volts, 3amps, 32rpm.

6. Ball bearing

A **ball bearing** is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races.

The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

Ball bearings tend to have lower load capacity for their size than other kinds of rolling-element bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races.

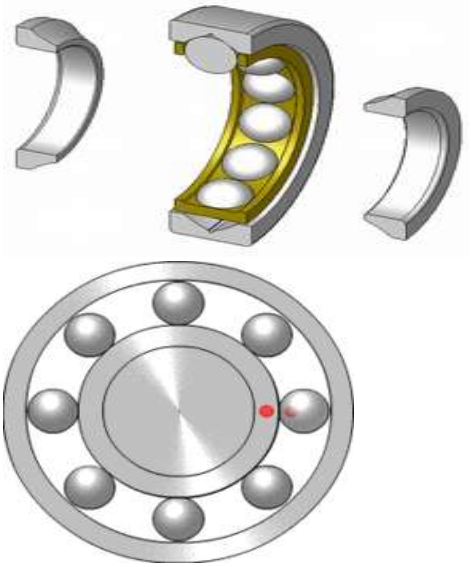

Figure2: Ball bearing

7. Advantages

- These cleaners are easy, cheapest way to fix drainage problems.
- Easy to operate as no special skill is required.
- Reduction of labor oriented method of cleaning, thus upgrading dignity of labor.
- Light weight and easily portable.
- Large amount of garbage can be collected and segregated for recycling, thus environmental friendly.
- Automatic, does not need manual monitoring, once set will be moving to the end.
- Highly efficient.
- Drain can be cleaned continuously since this machine is moving ahead to remove solid waste and collect it in basket which can be removed when filled.
- Replaces the manual work with automation.
- Problems of cleaning of drains, gutters has been solved by this machine.
- 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.
- We can incorporate this project with SWACCH BHARAT ABHIYAAN which is a revolution in present times.

8. Dis -advantages

- Since metal is used, can become rust.
- Cleaning regularly is required

9. Applications

- It can be used in all types of drainage (large, small, medium)
- It can be used in well planned cities and small cities to clean the drain with ease.
- It can be used in industries drainage cleaning also.

10. Conclusion

This draining cleaning system project made by us is quite satisfactory in working. The main intention of making this project is to reduce the human involvement in drain cleaning which is very hazardous for the health which raises health issues and also dignity. During making of this project we came across many design aspects, fabrication process and machining processes and learnt a lot during the making. We are happy to complete the project with successful trails.

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