FABRICATION OF IOT CONTROL AUTOMATIC DRAINAGE CLEANING MACHINE

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Abstract

In this design, we've fabricated the Automatic IoT Drainage cleaning machine. The design's main purpose is to reduce the human resources and time consumption for cleaning the drainage. This arrangement consists of motor, chain drive, wheel and collecting tank, IOT app, and Micro controller. In this studies paper, the proposed idea is to modernize the man-made work in drainage purification with an automated drainage cleaning machine. These days indeed though robotization plays a vital position in all business operations within the proper removal of sewage from industries and commercials is still a demanding task. Computerized Drainage Water cleansing overcomes all varieties of drainage issues and promotes blockage-free drains promoting the non-stop flow of drain water. Inside the present-day generation, there were adequate sewage issues where sewage water wishes to be segregated to clean our surroundings. Industries produce waste and gases that are extremely damaging to people and the environment. Our suggested system is used to clean and manipulate the drainage level the use of the automobile mechanism approach. Waste like bottle, plastic bags etc. The waste this is floating inside the drain is lifted by using teeth which might be connected to the chain. This chain is attached by gears driven by using a motor. While the motor runs the chain begins to flow making collecting teeth raise up. The waste materials are collected with the teeth and stored in the waste storage tank. H-bridge designed ic are used in DC vehicles. Dc motor management is important in many packages since the dc motor must be turned in both clockwise and counterclockwise directions. H bridge was built for this purpose. In this mission, the l293d ic is used to control two dc motors.

Keywords: DCMotor, Chain, Sprocket, IOT, Micro Controller, Wheel and Collecting Tank

1. Introduction

The fabrication of IOT control automatic drainage cleaning machine will be widely employed in manufacturing industries for low-cost automation. The weight lifting is quick and effortless, reducing the worker's physical weariness (tiredness). Waterlogging caused by plastic, thermocol, and metal encourages the spread of pests and diseases such as malaria and typhoid. This is dangerous to human life, which is why this initiative was created. The goal of the proposed project is to design and build an automated drainage cleaning system that would avoid humans from contracting diseases caused by infectious bacteria found in sewage when cleaning manually. The goal of this suggested system is to reduce or eliminate the issues that arise when employing man-operated machines and to minimize the increased dumping rate of the waste. Our proposed method is used to smooth and control the drainage stage using the automatic mechanism approach. Water going for walks via a water drainage device mainly carries along with waste materials maximum of that are nonbiodegradable. Overflow of a water drainage system occurs when an end of the drainage system is blocked, forcing the water to find its way somewhere other than the mapped-out drainage system. As a result, the running water spills over the horizontal height of the drainage system, spreading to regions alongside the drainage system, causing problems such as fences being pushed down, waterlogging of farmlands and residential buildings, and so on. Impurities in water can be dangerous and cause disease. The main drainage system's function, as far as the drainage system is concerned, is to collect, convey, and dispose of water through an outfall or outlet. Impurities in drainage water can be only empty bottles, polythene bags, papers, etc. The problem such as Environmental pollution and the spreading of viral diseases are avoidable. The automation of drainage cleaning systems would lessen the risk of diseases spreading as a result of trash accumulation. This Drainage Cleaning device will remove waste from the drainage surface, allowing water to flow freely. The device is placed across the drain, allowing only water and waste to flow through the bottom grids. Teeth attached to a chain hoist floating objects in the drain. A gear operated by a motor connects this chain. When the motor is turned on, the chain circulates, raising.The problem of water logging due to plastic, thermocol and metal leads to pest growth and it favors diseases like malaria, typhoid etc. This is unsafe for human life and hence the idea of this project emerged.

The goal of the proposed project is to design and build an automated drainage cleaning system that would avoid humans from contracting diseases caused by infectious bacteria found in sewage when cleaning manually. The goal of this proposed system is to reduce or eliminate the problems associated with using a man-operated equipment, as well as the

increased trash disposal rate.

Sometimes the drainage pipes used in drainage systems are very dirty and contains many organisms that can cause diseases. Therefore, to solve this problem they implemented a semi-automatic drainage cleaning system which can replace the manual scavenging by the automated mechanism [1]. Reviewed about the conversion of the manual work done in sewage water waste disposal into an automated sewage water waste disposal and treatment by the implementation of an economical and efficient mechanism by using the available resources. This has been employed for eliminating the risks of life of workers while doing scavenging. [2]Proposed the automatic cleaning of wastewater to prevent global warming and the melting of glaciers. The results emphasize the need for wastewater treatment plants, through which the water is treated before suspending in rivers. Firstly, power is generated, and that power is used for the wastewater cleaning process. [3]Explained E bucket (electronic bucket) use for the drainage cleaning system because E-bucket lifted sewage and used evaporation treatment for this sewage, wet sewage was converted into dry matters, with the of ARM board (ARDUINO), this process was performed. After this process, they added this waste to a government bank without any affection of the bacteria. [4]Explained the flow of used water from homes, business industries, commercial activities are called wastewater. 200 to 500-liters wastage water are generated by each person every day. So, using wastewater technology that removes, rather than destroys, a pollutant in a drainage system. [5]Showed the Drainage system cleaner machine used to remove garbage and sewage automatically, which helped to protect the environment from different kinds of environmental hazards. The drainage system cleaner has three significant parts, which are the Propeller, the Cleaner, and the Pan, all makeup for its effective functioning. [6]Reviewed about drainage cleaning to replace manual work to automated system because manually cleaning system it is harmful for human life and cleaning time, is more so to overcome this problem they implemented a design "Automatic drainage water pump monitoring and control system using PLC and SCADA". PLC and SCADA were designed. In this project to use efficient way to control the disposal of wastage regularly, treatment of disposal in different way toxic and nontoxic gases. PLC controller from Siemens was used in the treatment system of drainage wastewater control by the stepper motor, compressor, gas exhauster, pressure valve and the liquid level, flow and other analog variables to achieve automatic control of sewage waste water treatment. [7]

2. MaterialsandMethods

As soon as the setup is on, the sprocket and chain start to rotate. This sprocket and chain collect the waste materials from the sewage. The wheel's spin can be controlled, but the sprocket and chain's revolution is uncontrollable. The rotation of the wheel is controlled by Bluetooth Module and the wiper motor rotates the sprocket and the chain are directly connected to the battery. The Wi-Fi Transmitter acts as a remote and sends the signal to the receiver. In turn, the Wi-Fi receiver receives the signals and rotates the wheel as and when required. The Wi-Fi module consists of an encoder and a decoder. The functions of the encoder are to convert 2n inputs into n outputs. The receiver is made up of a decoder that transforms n inputs to 2n outputs. the Wi-Fi receiver module is connected to the 4-channel relay which rotates the motor clockwise or counters clockwise as per the given signal. The Wi-Fi transmitter consists of a remote switch. The signal transmission is proportional to the pressed button switch. The relay is energized by the corresponding pin, which in turn energizes the magnetic coil. The waste is collected and sent to a container attached to the back of the setup, which is cleaned on a regular basis.

RESEARCH	RESOURCES
MATERIAL PROCUREMENT	LITERATURE SURVEY
FABRICATION	IDENTIFYING GAPS
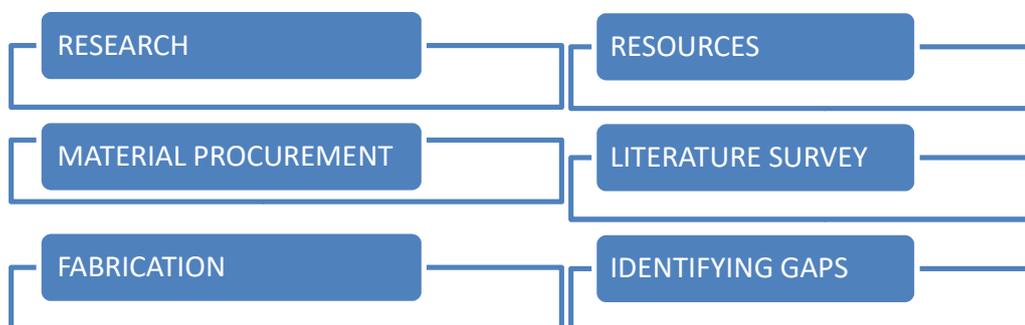
2.1RELAY

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which

attracts a lever and changes the switch contacts. The coil current can be on or off. So, relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. The link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly.

Fig.2.1Relay

2.2.CHAIN DRIVE

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 bicycles and motorcycles. It is also used in a wide variety of machines besides vehicles. The power is transmitted through a drive chain that passes over a sprocket gear, with the teeth of the gear meshing with the holes in the chain links. When the gear is turned, mechanical force is applied to the chain.

2.3. DC MOTOR

The operation of any electric motor is based on simple electromagnetism. When a current-carrying conductor is put in an external magnetic field, it experiences a force proportional to the conductor's current and the strength of the external magnetic field. As you may recall from your childhood experiences with magnets, opposite polarities (North and South) attract, whereas like polarities (North and North, South and South) repel. A DC motor's internal arrangement is designed to generate rotational motion by harnessing the magnetic interaction between a current-carrying wire and an external magnetic field.The structural stability of this design is dependent on the coil wire itself. The armature as a result is hollow. The permanent magnet can be placed inside the rotor coil as well. The armature inductance of coreless DC motors is substantially lower than that of iron-core motors of comparable size, extending brush and commutator life.

2.4.SPUR GEAR

Spur gears are the most basic and widely used type of gear. A cylinder or disc is the most common shape. The teeth protrude radially, and the leading edges of the teeth are parallel to the rotating axis in these straight-cut gears. Only when these gears are mounted on parallel axles can they mesh properly. The torque ratio can be determined by considering the force that a tooth of one gear exerts on a tooth of the other gear. Consider two teeth in contact at a point on the line joining the shaft axes of the two gears. The force will have both a radial and a circumferential component. Gears are a very useful simple machine. The torque ratio can be determined by considering the force that a tooth of one gear exerts on a tooth of the other gear. Consider two teeth in contact at a point on the line joining the shaft axes of the two gears.

2.5.MICRO CONTROLLER

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more strongly than one can imagine. Since its emergence in the early 1980's the microcontroller has been recognized as a general purpose building block for intelligent digital systems. It is finding using diverse area, starting from simple children's toys to highly complex spacecraft. Because of its versatility and many advantages, the application domain has spread in

all conceivable directions, making it ubiquitous. If a system is designed with a CPU, external memory such as RAM, ROM, or EPROM, as well as peripherals, the PCB must be large enough to accommodate all of the essential peripherals. However, because the micro controller includes all of these peripheral functions on a single chip, designing a similar system with a micro controller decreases the size of the PCB and the design cost.

2.6.ESP8266 WIFI MODULE

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield has to offer (right out of the box)! The ESP8266 module is a low-cost board with a large and rapidly increasing community.This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and It has Bluetooth co-existence interfaces, a self-calibrated RF that allows it to work in all operational situations, and no extra RF parts are required.

3. CONCEPTUAL DESIGN

The motor rotates the collecting plate and chain drives continually using battery power. To collect waste materials from the drainage, the collecting plate is connected to the two chain drives. The gathered waste is then put onto a collection tray. Our project is having wheels for movable application. The IOT app (mobile) keypad is used to control the direction of the motor which is coupled with the spur gear. Relay is directly connected with the DC motor. When the start key is pressed the motor is operated in forward direction and the when the stop key is pressed the motor is stops automatically. The forward and reverse button in the remote is used to operate the motor is required directions. IOT app Using to Control All Operation Using Wireless Communication.
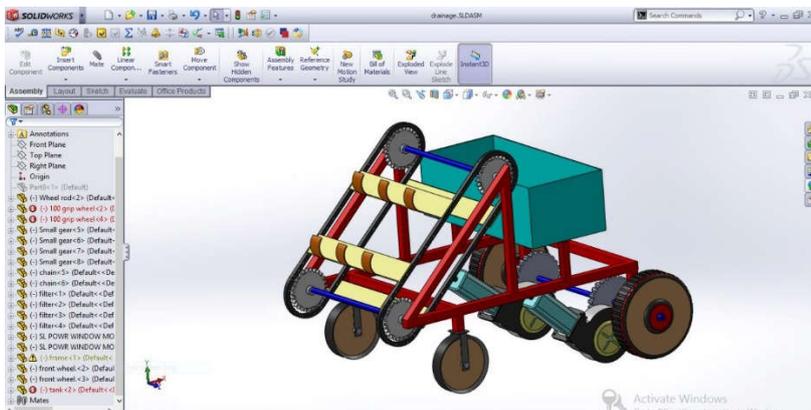

Fig.33DviewofAutomatic Drainage Cleaning Machine
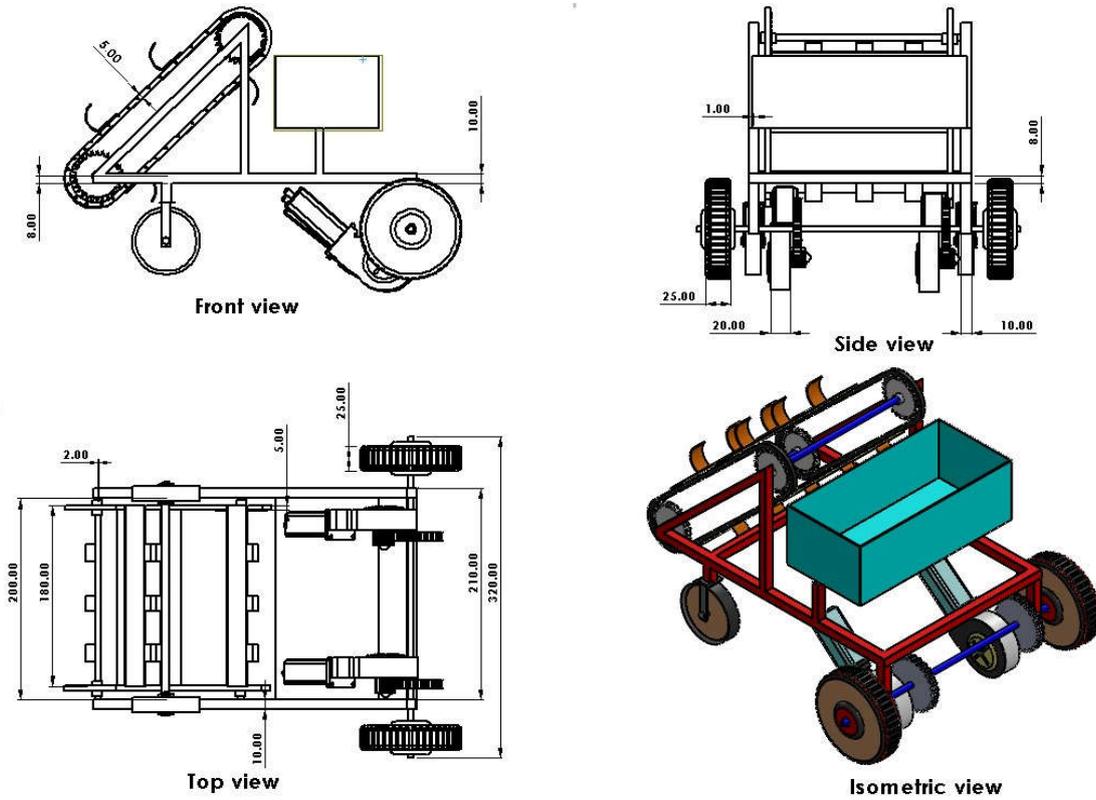
3.1. DETAILED DESIGN

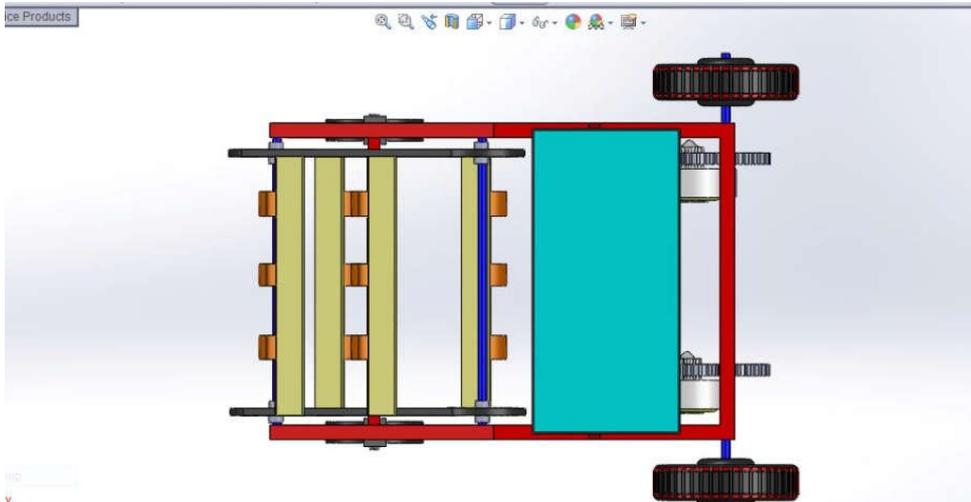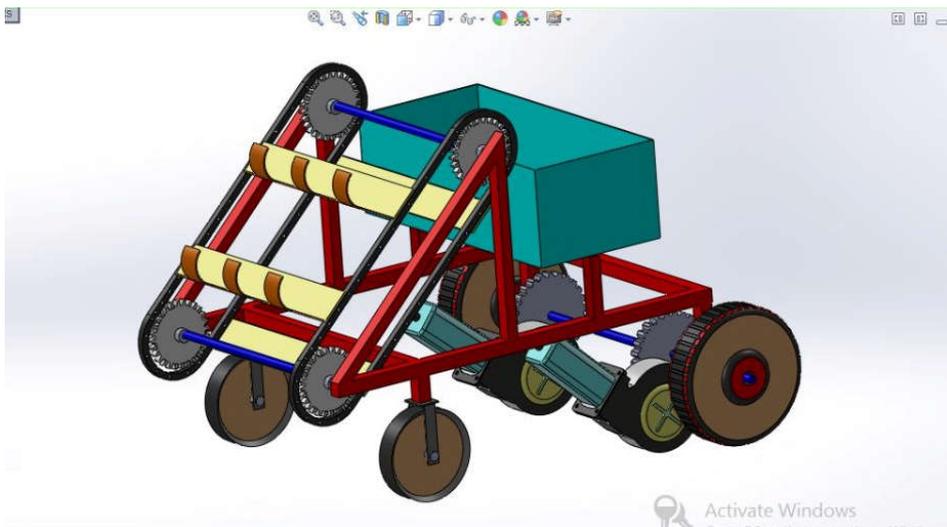Fig.3.1 ConceptualdesignofAutomatic Drainage Cleaning Machine

Fig.3.2 Top View

Fig.3.3Left Side View
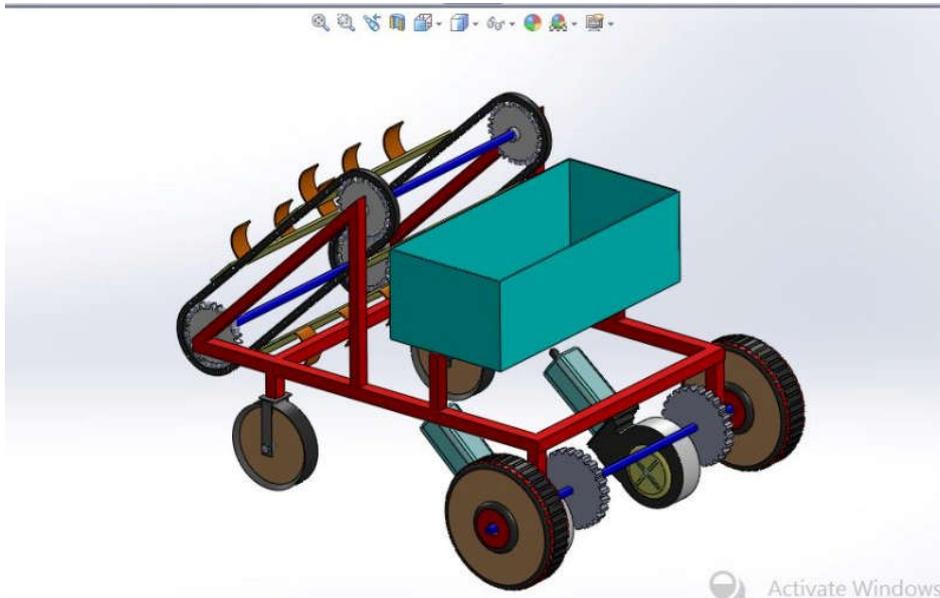
Fig.6.4Right Side View

4. ANALYSIS RESULT

4.1.CALCULATION

4.1.1. Selection of Motor:

Assuming water pressure on frame is 2000 kg/m³

$$
\begin{aligned}
P &= 2000 \text{ kg/m}^3 \\
m &= PV \\
&= 2000 \times 0.35 \times 0.6 \times 0.005 \\
m &= 2.1 \text{ kg} \\
w &= mg \\
&= 2.1 \times 9.81 \\
&= 20.601 \text{ N} \\
\text{Pressure} &= \text{Force/Area} \\
&= 20.601/(210 \times 10^3) \\
&= 98.1 \text{ Pa}
\end{aligned}
$$

As its pressure limit is 5 kgf/cm² which is greater than calculated pressure 0.0010034 kgf/cm².

4.1.2 Selection of Motor:

Speed (N) = 30 rpm   We suppose the weight of garbage = 4 kg

Pulley size is = 320 mm

$$FOS = 1.5$$
$$Force = 4 \times 9.81$$
$$= 39.24N$$
$$Torque = Force \times Distance$$
$$= 39.24 \times 320$$
$$= 12556.8 \text{ N-mm}$$
$$Torque = 12.5568 \text{ N-m}$$

Therefore,

$$Maximum\ Torque = 12.5568 \times 1.5$$
$$= 18.8352 \text{ N-m}$$

Now,

$$Power = (2\pi NT)/60$$
$$= (2 \times 30 \times 18.8352)/60$$
$$= 59.1725 \text{ watts.}$$

Therefore,

1. Selecting motor of power of 84 watts so losses can be avoided.
2. Voltage: 12volt
3. Current: 7 amp
4. Speed: 30 rpm

5. RESULT AND DISCUSSION

Drainage Cleaning System is a social incentive project where we tried to present a much better procedure to keep our drain clean and thus provide the way to cleaner and safer surroundings. It's a portable machine with a medium weight and low power consumption. A large amount of garbage is collected and sent for recycling. We performed the following test, and the results are discussed as follows. Weight Lifted:

- We tried to present the model where the model is successfully able to lift the 4 Kg by two collecting trays.
- The total weight of the machine is around 15 kilograms.
- As the setup performs excellently on the constraints condition that has been designed because of the real-life drain condition, we try to provide the drain with a minimum speed of 30- 50rpm.
- Time taken by each lifter to lift each object from bottom to top is 14sec. The quantity of waste collected in the collecting bin is nearly 9-10 kilograms.

Fig.5.1Automatic Drainage Cleaning Machine

Fig.5.2 Side View Automatic Drainage Cleaning Machine

6. CONCLUSION

Automation is the use of mechanical, electronic, and computer-based systems to operate and control manufacturing processes. This system is used to operate an automatic drainage cleaning system. This project could be completed with the full use of workers, machinery, materials, and funds. Furthermore, we have thoroughly followed the study of time motion and have made our project cost-effective and efficient using the available resources. We hope that this will be done among the most versatile and interchangeable ones even in the future. We will be able to obtain automatic drainage cleaning equipment as a result of this. The main drainage system's function, as far as drainage is involved, is to collect, carry, and dispose of water through an outfall or outlet. The drain wastewater cleaner machine is designed and manufactured by using gear changing and shaft coupling principles. It consists mainly of DC geared motor, shafts, waste removal plates, dust bin, bearings, sprocket, and chains. Construction materials are easily available, create employment (construction and maintenance), simple to construct. This system was successfully developed, fabricated, and tested. It works satisfactorily.

7. REFERENCES

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