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# Design and Fabrication of Trenching Machine

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**ABSTRACT**: We are designing mini trencher, which is to be compact and is semi-automatic in nature. The Ultimate goal is to make economical and easy to use trenching machine for digging, ploughing and underground pipe line system.The Study deals with designing of all the parts of a walk behind trenchers, analysis of assembly along with focus on reducing the cost of the machine, which will result in reduced human effort for trenching and thus reducing time consumption for excavation.Digging of trench using digging shovel or spades will be efficient for the first few feet of depth, but after a certain depth the operation will only lead to backache and frustration as the operation performed is ineffective.

**KEY WORDS:**Trencher, ditch, Cost, Cutting Tool, Trenching Machine.

## I. INTRODUCTION

It can be observed that manual or shovel trenching is performed by¬ homeowners to create trenches for various gardening projects.

Additionally professional trenching crew resort to hand tools when need of trenching in areas where their trenchers can't fit arises. Digging of trench using digging shovel or spades will be efficient for the first few feet of depth, but after a certain depth the operation will only lead to backache and frustration as the operation performed is ineffective.

In order to tackle this problem there is a need to design a trenching machine which is small in size than tractor mount trenching machines which are currently being used in India which are easily manure-able compared to other type of trenchers, additionally they are light in weight. Tractor mount trenches can't be used in compact spaces and have expensive. Digging of trench using digging shovel or spades will be efficient for the first few feet of depth, but after a certain depth the operation will only lead to backache and frustration as the operation performed is ineffective. Rental, additionally they require a creeping gear tractor for functioning. Larger machines are more productive, but the downside of large size is transportation. Another downside is that a large machine might do more damage than necessary on an established project.

The alternative to these types of trenchers are portable trenchers. Such trenchers can be used for laying of pipelines, cables and for setting up irrigation lines on comparatively soft grade land. The width and depth of these portable trenchers facilitates their optimum use. With micro trencher operations, the structure of the road is not compromised and damage associated to roads is minimized. Decrease in excavated material facilitates minimization of traffic, pedestrian disturbance. Additionally, the portable trenchers can be used to install irrigation lines in areas where reach of tractor mount trenchers is not possible.

A trench is a long narrow ditch dug in the ground, the machine used for administering such a ditch is called trenching machines. Trenching machine are bifurcated depending upon their size and consist of portable, attachment and heavy duty type. The attachment type trenchers are extensively used in India, but have conditional usage depending upon the various local factors. Contrary to this type, the portable trenchers are more efficient in the Indian scenario. Owing to the undeveloped market the availability these trenchers is limited and they are overpriced. These trenchers are comfortable because of their small size and low cost. Thus development in the field of trenchers needs to be carried out in order to successfully extract all its advantages. The main component of this machine is digging chain, main power generating unit, power transmission device, sprocket and frame. The project deals with designing of all the parts of a walk behind trenchers, analysis of assembly along with focus on reducing the cost of the machine, which will result in reduced human effort for trenching and thus reducing time consumption for excavation.

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## II. DESIGN AND SELECTION OF ELEMENTS

We have calculated the resistive force on tool and the selection of the engine for the functioning of cutting teeth with maximum efficiency and economy. The design selected here, depends upon the need of the customers.

1. Resistive force on tool

Fundamental earth moving equation described by Jane Reece,

$F = (\gamma\ g\ d\ 2\ Ny + c\ d\ NC + q\ d\ Nq)\ w$

g = gravitational acceleration = 9.81 m/s 2,

$\gamma$ = soil density = 1550 Kg/m3 = 15,205.5 N/m3

d = tool depth below soil = 0.025 m,

c = Soil cohesion = 29.23 KPa. = 29230 N/m2

q = surcharge pressure (neglected due to its small value.)w = width of tool = 0.03mNy, Nc, Nq= factors depending on soil friction, Strength and tool geometry.

$Ny = \cot\rho+\cot\beta\ 2[\cos(\rho+\delta)+\cot(\beta+\phi)\sin(\rho+\beta)]$

$Nc = 1+\cot\beta\cot(\beta+\phi)\cos(\rho+\delta)+\sin(\rho+\delta)\cot(\beta+\phi)$

$Nq = \cot\rho+\cot\beta\cos(\rho+\delta)+\sin(\rho+\delta)\cot(\beta+\phi)$

Where, $\beta$ = 30 degree, $\delta$ = 52 degree, $\phi$ = 36 degree, $\rho$ = 61 degree

So, the values of constants are

Ny = 26.59, Nc = 41.26, Nq = 53.17

F = 91.29 N There are two cutting tools are engaged at one time,

**F = 91.29N**

2. Selection of Engine

An engine or motor is a machine used to convert one form of energy into mechanical energy. The functionality of the engine is to drive the chain of the trenching machine.

Engine Specifications: Engine Displacement = 111.6 cc,

Engine Type = Air Cooled, 4 Stroke engine

Number of Cylinders = 1 Valves per Cylinder = 1

Max Power = 7.8PS@7000 rpm = 7.7 BHP = 5.74 Kw.

## III. COMPONENTS

- Components to be manufactured

| Sr. No. | Component | Material |
|---|---|---|
| 1 | Engine Chain Sprocket | Mild Steel |
| 2 | Lock Plate | Mild Steel |
| 3 | Frame | Mild Steel |
| 4 | Cutting Blade | Stainless Steel |

- Components to be brought

| Sr. No. | Components |
|---|---|
| 1 | 4 Stroke IC Engine |
| 2 | Plastic Wheel |
| 3 | Ball Bearing |
| 4 | Roller Chain |
| 5 | Clutch cable |
| 6 | Acceleration Cable |
| 7 | Bolt |
| 8 | Lock Nut |
| 9 | Wheel Bush |

## IV. CONCLUSION

The future scope of the project mainly lies in implementation of hydraulic system to determine the depth of the cut. This will facilitate automation and reduce the mechanical dependence on the trencher. Various parts are taken into considerations while designing the trencher machine. The mini trencher machine suggested here has wide applications in different sectors such as, for installing underground irrigation system in farming land, installing drainage system, etc.

## REFERENCE

[1]. Author P. Parthiban et al, "Machine design and analysis to land long narrow way cutting (digging) for significant of bury by cable line, pipe and sewage line", International Journal of Mechanical Engineering and Robotics Research, 2014.

[2]. Amal M. S.et al, "Design and Fabrication of Trenching Machine", International Journal of Advanced Engineering and Global Technology, March 2016, vol. 4 Issue 2.

[3]. ChitralekhaDey et al, "Development of Rotavator in Soil Trenching Applications", Proc. Of International Conference on Advances in Robotic, Mechanical Engineering and Design, 2011.

[4]. Bhaveshkumar P. Patel et al, "Evaluation of Bucket Capacity, Digging Force Calculations and Static Force Analysis of Mini Hydraulic Backhoe Excavator", Machine Design, Vol. 4, 2012, pp. 59-66.

[5]. Bhaveshkumar P. Patel, J. M. Prajapati, "Evaluation of Resistive Force using Principal of Soil Mechanics for Mini Hydraulic Backhoe Excavator", International Journal of Machine Learning and computing, Vol. 2, No. 4, August 2012

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