

Design and Fabrication of Automatic Bar Feeding and Cutting Mechanism

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ABSTRACT

In a day to day Machining operation have been performed on shaft or any shape of rod, at first a given work piece is supposed to be cut to appropriate dimensions and then followed by machining operation is carried on. Nowadays, it's been a time taking chore, in a manual operation the cutting bar cuts to the demanded dimensions. Due to manual trimming, notable marks may lead to the job rejection. The project mainly deals with the clamping, cutting and automatic bar feeding. A microcontroller based device is used for automation, and in order to control the various tasks which are demanded for bar cutting. Basic, view of this design to increase delicacy and reducing the mortal trouble which helps to increase the product rate. To stop the movement of rollers we use Limit switch as per requirement for clamping purpose we use pneumatic cylinder, which also holds the rod tight for the purpose of reducing human effort for repetitive work. Control panel can monitor the no of pieces, length of cut and the parameters can be varied as per need.

Keywords:- Feeding, bar cutting, Automation, Clamping, reducing human effort.

INTRODUCTION

In the present trend automation demands mechanical power for the substitution of manual effort in any kind of automation. Project mainly aims the accuracy while cutting mild steel bars of different shapes and sizes and for ease while feeding. The main advantage of automation is it helps to decrease labor costs. Essentially it is used to save energy as well as materials and to improve accuracy, precision and quality. The common slice machines used in the artificial operation are hacksaws, abrasive cutters, reciprocating hacksaws. Thus this is a lengthy procedure and involves the following steps

- 1) Measure of the bar to required length and printing marks on it
- 2) Loading on to cutting machine.

3) Setting for cutting procedure.

4) Cutting to marked length.

5) Unloading the cut bar

Accuracy of the output mainly depends on the operator, setting the work piece on the machine. In this present scenario electrically operated power hacksaw machines manufactured by different companies with different variations are existing for cutting different kinds of cross sections.

These are of so precise that they can cut metal bars with minimum time made up of different materials but they have one and major disadvantage that those are able to cut at faster rate as well as these require manual intervention for every operation of bar to be cut. As bar cutting are not frequent operations that are not being used in

industries, further these bars mainly involves various machining operations like turning milling and key way slotting on them [2]. Thus a kind of system is to be innovated which is used to handle the operation of bar cutting effectively in such a way that it requires minimum mechanical effort and carry out the bar feeding as well as cutting operation automatically. To overcome these advantages, this project involves designing and fabrication of automatic bar feeding and cutting machine (for fixed size of 16 mm), which not only saves the time but also is accurate as it is computerized [1]. This involves developing a system in which the user just enters the length of the bar to be cut using a keypad and the bar is fed and cut automatically.

The main execution of project is requisite to grasp the present work done in this. Since its major courtesy is been given by research scholars have carried out different research work on this field. Adequate notable points have been given below. Prof. Iman Hajizadeh Chi-Ghun Lee (1992) has studied a substitutive configuration for the cutting machine in a tube cutting mill". In our assumption inventory is continuous. They made and solved a fresh cutting stock problem and revealed that the significance of saving is to be look for the new layout that can be employed [3].

The conclusions of experimentation has shown that by opening end of the cutting machine they have shown numerically that the production time could be decreased by up to 44% such improvement would help production managers in tube mills reduce costs such as finished product inventory, labor cost [1]. Prof. Rushikesh Gadale et al, (2015) developed PLC grounded automatic cutting machine.

Prof. Kshirsagar Prashant R. et al,(2015) has put forward the multi-tasking hacksaw

machine which can cut four work pieces with minimum jerk and least amount of vibrations. The model is mainly implied to convert the rotary shaft motion into the reciprocating motion of hacksaw. Limitations have been overcome in this model, hacksaw which is used to cut single piece at a go. As the machine cannot cut the metal bars of different samples at a go which may not be helpful in many industrial applications due to the machines less compatibility reliability and efficiency. Although there is research work carried out on this field, but not oriented towards this kind of machine.

WORKING MECHANISM

When the motor is running the bar will be moving from initial to the desired length, the length can be adjusted with the help of push buttons which are operated on the control panel by using the length adjusting unit.

As we see the components of machine. The L molded outline structure in that. As finds in fig. arrangement set. There are 3 DC motors. First engine for move the pipe ahead as clock set. When the engine halt running, the second engine begins which is for clamping the pipe fit with the assistance of screw jack. When clamped completed the third engine begin & the cutter is connected to this motor [4].so that cutter move along the course of pipe. A hexa blade which is made from abrasive fabric is cut the pipe at cutting section. And engine goes to their back position.

MOVEMENT SYSTEM

After completion of the set up we have to concentrate on the movement part coding is given to Arduino uno board and this controls the motor driver and rollers for the pipe feeding and with the help of ultrasonic sensor feeding operation will be stopped and cutting operation will starts and cutting

machine movement is under the control of Arduino uno board

CODING PART

```
INT ECHOPIN= 6;
int trigPin= 5;
int minDistance = 150;
int maxDistance = 300;
int led=3;
int m1=7;
int m2=8;
int m3=9;
int m4=10;
void setup() {
  Serial.begin (9600);
  pinMode(trigPin, OUTPUT);
  pinMode(m1,OUTPUT);
  pinMode(m2,OUTPUT);
  pinMode(m3,OUTPUT);
  pinMode(m4,OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(led, OUTPUT);
}
void loop() {
  long duration, distance;
  digitalWrite(m1,1);
  digitalWrite(m2,0);
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = duration*340/20000;
  if (distance >=15 && distance<=20)
  {
    digitalWrite(m1,0);
    digitalWrite(m2,0);
    digitalWrite(m3,1);
    digitalWrite(m4,0);
    delay(3000);
    digitalWrite(m3,0);
    digitalWrite(m4,1);
    delay(3000);
    digitalWrite(m3,0);
    digitalWrite(m4,0);
  }
  else {
    digitalWrite(m1,1);
```

```
digitalWrite(m2,0);  
}  
Serial.print(distance);  
Serial.println(" cm");  
delay(500);}
```

COMPONENTS

Components Involved

- Basic Frame
- Cutting machine
- DC motor for cutter
- DC motor for pipe
- DC motor for VICE
- Roller
- PVC pipe
- Cutter blade
- Gear arrangement to move pipe
- Micro Controller
- Ultra sonic sensor
- Motor driver
- Battery

Basic Frame [Figure 1]

Basic frame is made with mild steel which can be called as low carbon steel because it is a type of carbon steel which is having low

amount of carbon because having less amount of carbon it is more ductile and machinable and weldable than other steels which are having high carbon percentage.



Fig.1:-Basic frame made with mild steel

Cutting Machine [Figure 2]

In the machining process shear deformation takes place and material is removed with the help of cutting tool .cutting edge is contact with the work piece that the tool dragging

on the work piece surface without taking any delay and angle of the cutting tool plays a major role and speed and feed is maintained constantly to get expected output and to have long working life for

tool.



Fig.2:-Cutting Machine

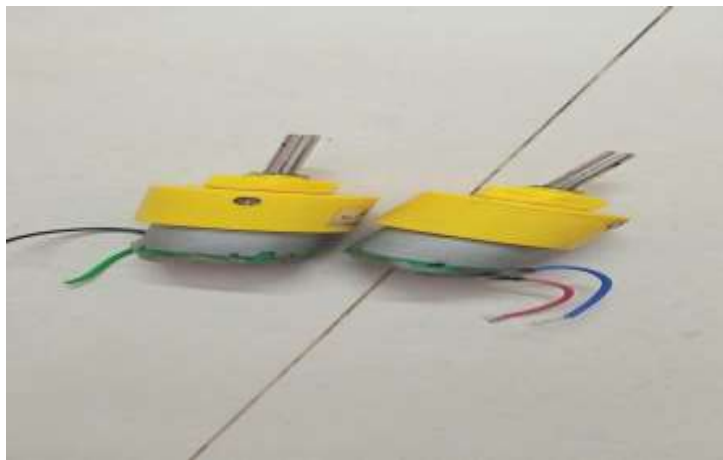


Fig.3:-DC Motor

DC Motor [Figure 3]

Motors take electrical energy and it converts into mechanical energy that mechanical movements around us in everyday life is done with help of mechanical motors we

are using motor with 30 rpm and motors having large amount of horse power are mainly used in industries large motor application involves in the elevators, electric trains and heavy metal rolling mill.



Fig.4:-Roller

Roller [Figure 4]

Motion to the can be given by rollers which helps to push the pipe by consuming less power and its it helps to feed the pipe easily

to reduce the time and increases productivity.

Ultra Sonic Sensor [Figure 5]



Fig.5:-Ultrasonic Sensor

The instrument that measures the distance to an object with the help of ultrasonic sound waves is called ultrasonic sensor. Ultrasonic sensors transmit sound waves toward a

target and will decide it's separate by measuring the time it took for the reflected waves to return to the collector.

Motor driver [Figure 6]



Fig.6:-Motor Driver

A motor driver is a coordinate's circuit chip which is ordinarily utilized to control motors in independent robots motor motorist act as an interface between Arduino and the motors. The foremost commonly utilized motor driver IC's are from the L293 arrangement such as L293D,

L293NE, etc. These ICs are outlined to control 2 DC engines at the same time. L293D comprise of two H-bridge. H-bridge is the only circuit for controlling a moo current evaluated motor. We'll be alluding the motor driver IC as L293D as it were. L293D has 16 pins.



Fig.7:-Micro Controller

Microcontroller [Figure 7]

A microcontroller may be a compact coordinates circuit outlined to oversee a particular operation in an implanted framework. A ordinary microcontroller incorporates a processor, memory and input/output (I/O) peripherals on a single chip. Some of the time alluded to as an inserted controller or microcontroller unit (MCU), microcontrollers are found in

vehicles, robots, office machines, therapeutic gadgets, portable radio handsets, distributing machines and domestic apparatuses, among other gadgets. They are basically straightforward smaller than expected individual computers (PCs) outlined to control little highlights of a bigger component, without a complex front-end working framework (OS).



Fig.8:-Gear Arrangement

Gear Arrangement [Figure 8]

A gear could be a turning circular machine portion having cut teeth or, within the case of a cogwheel or gearwheel, embedded teeth (called cogs), which work with another toothed portion to transmit torque. A gear may too be known casually as a cog. Equipped gadgets can alter the speed, torque, and course of a control source. Gears of diverse sizes deliver a alter in

torque, making a mechanical advantage, through their equip proportion, and hence may be considered a basic machine. The rotational speeds, and the torques, of two fitting gears contrast in extent to their breadths. The teeth on the two coinciding gears all have the same shape.

Battery [Figure 9]

The battery is used for the power supply to the motors. There should be the battery for the free movement without any wire setup

from external power supply



Fig.9:-Battery

PVC Pipe [Figure 10]



Fig.10:-PVC Pipe

PVC pipes are made out of a material known as polyvinyl chloride, a durable, strong plastic-like substance. Pipes are

constructed from this material and used in various functions from plumbing to construction.

WORKING MODEL [Figure 11]

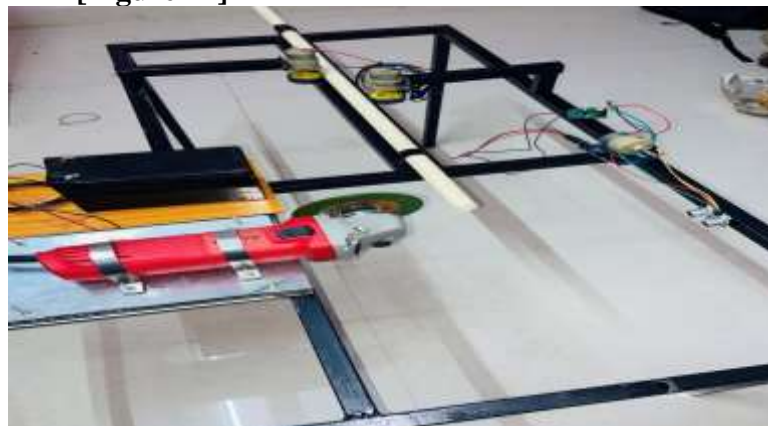


Fig.11:-Working Model

ADVANTAGES

- ❖ Construction is simple
- ❖ Compact in nature
- ❖ Number of components used are less
- ❖ Increased productivity
- ❖ can be used for solid as well as hollow cross sections

APPLICATIONS

- ❖ In Work Shops and metal Cutting Industries
- ❖ General Pipe cutting.
- ❖ cutting of Splendor rod
- ❖ Round, Square, Oval, Hexagonal, etc shape materials can also feed by using this mechanism

CONCLUSION

In this work we have tried to bring out an alternative for existing pipe cutter, with implementing some of modern techniques to the machine. In order to automate the entry of pipe in to machine, and to eliminate the fluctuations in power and decrease initial investment there would be decrease in time consumption ,compared to manual cutting machine.

FUTURE SCOPE

As most of the industries and companies demand high production rate and the most

cheapest cost possible, in this project the pipe cutting has been carried out as low cost as possible .by this mechanism of feeding the bar would be helping to cut more number of pipes at less amount of time and the automation would be making the task easier. Automation leads to reduction in the loss, in order to increase the productivity by investing small capital and less equipment.

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