

Automatic Bar Feeding, Clamping and Cutting Machine

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ABSTRACT

Machining the shaft or any shape of rod, first it should be cut to appropriate length & then the machining operation is to be carried out. Nowadays, it is a time consuming task as the process of cutting bar to the required length happens manually. Due to this manual cutting, erroneous marking may result in the job rejection. So, to eliminate this error and also human intervention this project is introduced. The project deals with the concept of automatic bar feeding, clamping and cutting. In this project, an automatic feeding mechanism, clamping mechanism as well as cutting is provided. A microcontroller is used for automation, and to control the various actions which is required for this bar cutting. Basic, view of this project to increase accuracy and reducing the human effort which helps to increase the production rate.

Keywords: Feeding, Automation, Clamping, Bar cutting, Length, Pneumatic system

I. INTRODUCTION

This is an era of automation where, it is defined as replace the manual work into mechanical power in all degrees of automation. It is a full automation where human participation is negligible. A mechanical engineering without design, production and manufacturing is meaningless. The primary concern of this system is to carry out operations that are feeding, clamping and cutting. The sequence of the operations must be precisely timed and maintained. The main work of this project is to cut the rod or pipe with a proper length in number of pieces according to the batch production. The selection of the cutter is based on the type of material which has to be cut. The material preferred in this system is mild steel for the demonstration. Nowadays, almost all the manufacturing process is being automatised in order to deliver the product at faster rate. The system can be maintained and controlled by microcontroller which is attached to the relay circuit. Due to this system, the required time for the cutting is set. Automation in the

modern world is inevitable. Any automatic machine focus on the economical use of man, machine, and material worth the most. The bar feeding and cutting machine works with the help of pneumatic double acting cylinder. The piston cylinder is connected to the moving cutting tool, the machine is portable in size, so easy transportable.

II. PROBLEM IDENTIFICATION

The common problems are facing during cutting are cross cutting of pipes, rods, time management, cutting time etc. The base of the bar cutting operation is not properly fixed such that while cutting, there occurs a crosscutting. The base part is hold by hands such that while cutting the pipe will move rapidly and due to that the cross cutting operation is occurred. If a bar diameter is larger in size, then it is more difficult to cut the bar. It takes more time to perform this operation. Therefore, to reduce human error and to increase production rate, this project is made.

III. LITERATURE REVIEW

The vast review of literature will help to understand concepts, theorems, and different factors affecting the performance of machine.

P.Balashanmugm and G.Balasubramanian [1] pneumatically operated typical pipe cutting machine d.c valve and flow control valve is used for semi-automation. The pipe cutting machine works on pneumatic double acting cylinder. The piston is attached to the movable cutting tool.

Nimbalkar Shripad, Velanje Sagar, Patil Abhay [2] has conducted invention relates to pneumatically operated automatic pipe-cutting machine. The arrangement of the pneumatic valves deployed in this system in accordance to the circuit planned. The choice of cutter is based on the stress calculated. The material favoured in this system is a Mild steel as well as PVC pipe or any other soft material.

ShitalK.Sharma, AshishV.Waghmare, PranitS.Wakhare [3] has provided an alternative to the existing automatic PVC pipe cutting machine, in terms of automating the pipe entry into the cutting apparatus, eliminates power fluctuation and lesser initial investment. The clamping arrangement can be changed according to need of operations which is suitable. The overall system is compact in size, light weight, modular and flexible to be used in small works jobs who need batch production.

IV. METHODOLOGY

Our project "Design and construction of automated bar feeding mechanism" idea taken after refer some literature review paper, generate new idea about configuration, first came design concept, we are develop general frame for make it, perform number of operation such as tool drilling machine, lathe machine, saw, and arc welding are to be required. Such part we assembled on frame like pneumatic

solenoid valve, motor and proximity sensor is situated in front of pipe ,metal rods clamping system because it is sense the pipe and on switch of motor, pipe cutting start after cutting pipe motor will be automatically off and de-clamping pipe, fast cutting operation this process continuously perform.

There are various components that are needed to make the project work such as:-

1. Frame:-This is the base structure of our project where all the components are to be assembled. It also having a base plate and fixed plate on which motor or clamping device is fixed.



Figure 1. Frame

2. Microcontroller: - ATMEGA16 is a 8 bit high performance microcontroller of AVR family with low power consumption. It requires only 5 volt DC supply. It is used only for single task.



Figure 2. Microcontroller

3. Relay Switch :- There are many types of relay, but we are using electromagnetic relay. These relays are

constructed with electrical, mechanical and magnetic components.



Figure 3. Relay switch



Figure 6. Pneumatic cylinder

4. Rollers: - Rollers are used to give the motion to the bar so that it can be easily pushed with less power.



Figure 4. Roller

5. Dc geared motor: - This motor is suitable for high torque and low speed working conditions.



Figure 5. DC geared motor

6. Two stroke pneumatic cylinder: - A pneumatic cylinder is a linear actuator that works with compressed air. The cylinder's main parts are the piston, piston rod, cylinder tube, gasket's, and seals.

7. Pneumatic solenoid valve (5/2):- It is used to direct for stop the flow of compressed air to the appliances. It can also use to actuate a cylinder or air tools.



Figure 7. Pneumatic solenoid valve

Table 1. Components & Its Specification

S.N	Major Components used in the fabrication of project		
	Component	Qty	Specification
1.	Microcontroller (AVRatmega16)	1	Frequency-16Mhz I/P Voltage-5Vdc
2.	Piston cylinder (Double acting)	2	Pressure-13.5bar Bore -25mm Length-125mm

3.	Solenoid valve	1	Voltage-12V dc Pressure- more than 10bar
4.	Cutter	1	Disc dia.-132mm Power-670watts Torque-0.58Nm Speed-2600rpm
5.	Air Compressor	1	Pressure-up to 10bar
6.	Sprocket	3	Out dia-76mm No. of tooth-18 Material-Steel
7.	Geared motor	1	Voltage-12V dc Power-24.67watts Speed-20rpm Torque-11.78Nm

V. WORKING PRINCIPLE

DC Power supply of 12V is given to the machine. The motor runs at 10rpm with high torque rotate the roller by using chain transmission, so that the bar is moving from initial position to the determined position. Proximity sensor is used to detect the work material & to specify the dimension. After that piston cylinder which is used in the pneumatic system clams the rod. The rollers attached to dc geared motor which feeds the bar in forward direction. When the feed rod detects by the proximity sensor then motor stops feeding, it get clamped and cutting operation takes place. A scale of 30cm is used to measure the length of the rod which is to be cut. This process is carried out in a continuous manner.

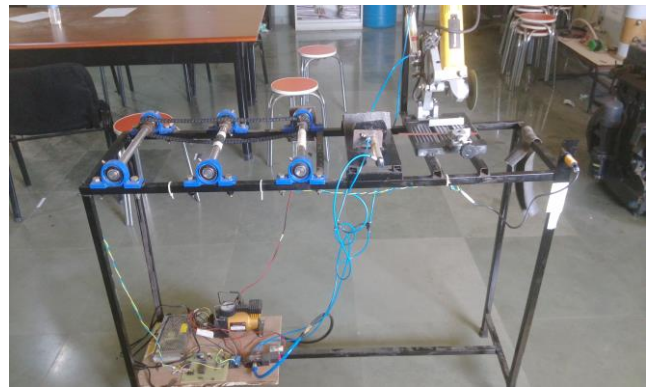


Figure 8. Automatic bar feeding and cutting machine.

VI. CONCLUSION

The design and fabrication of automatic bar feeding and cutting mechanism will be very useful for small scale industries, workshops, etc. we have studied the various automated electronics components such as relays, solenoid valve, microcontrollers, etc. The main aim of this machine is to reduce the human effort, timing for workpiece cutting and neglect the time for measuring the workpiece. This aim is achieved by bringing the automation to the machine. There are some machines which has been already made, but we have introduced some new components and we also have different design which increases the efficiency of work.

VII. FUTURE SCOPE

This project has scope in production industries and mechanical workshops where bar cutting is carried out, since company demands higher production at cheaper cost. Mechanism of bar feeding will help to cut multiple bars at a less time and automation makes it easy.

This automation can surely reduce the loss thereby increasing the productivity by investing small capital and less equipment. This machine can save the wastage of material and we can get the product with high accuracy.

VIII. REFERENCES

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