

SEMI-AUTOMATIC PIPE CUTTING MACHINE

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ABSTRACT

They are using much industrial application. Where Square, Rectangle, Round (solid & hallow) Bar cutting in required dimension in this machine. They are use Job & Mass production. This machine is high efficiency and faster operation, increases productivity, reliability, accuracy for required job. Cutting tool depend upon cutting material. This project is Semi-automatic cutting machine.

Key words: *Cutting Mechanism etc.*

I. INTRODUCTION

Cutting machine is one of the principal machines in industry. There is continuous development of sophisticated machines and modern techniques are implemented for economical manufacturing of products. At the same time, care should be taken that there has been no compromise made with quality and accuracy. In the age of automation, machine becomes an integral part of human being. By the use of automation machine prove itself that it gives high production rate than manual production rate. Today, automation has powerfully entered in the industrial manufacturing process in order to get identical and accuracy of each product by reducing the human involvement. Automatic pipe cutting machine is one of such machine use for mass production and aim at reducing the human involvement in order to increase the productivity and accuracy of the product. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. Automatic pneumatic pipe cutting machine uses a pneumatic circuit for cutting of PVC pipes which, ultimately reduces the total time required for the complete cutting operation and increases the production rate.

II. OBJECTIVES

- To reduce the man power.
- To maintain the accuracy in pipe cutting process.
- To perform the most rigid operation with high speed cutting.
- To develop automation unit for the drill so that m/c can easily be adopted in today's automated plants.
- To fulfill need of mass production in shortest possible time.

III. LITERATURE REVIEW

Menghani et. al. [1] has developed automatic pipe cutting machine to cut the bar. Due to its compatibility, reliability it is able to cut bars of different materials. It provides 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.

Bipinchandra et. al. [2] has designed and fabricated Automatic-Pneumatic Pipe Cutting Machine. Pneumatic mechanism is used in machine which reduce the manpower, maintain the accuracy in pipe cutting process, fulfill need of mass production in shortest possible time.

IV. THEORETICAL WORKS

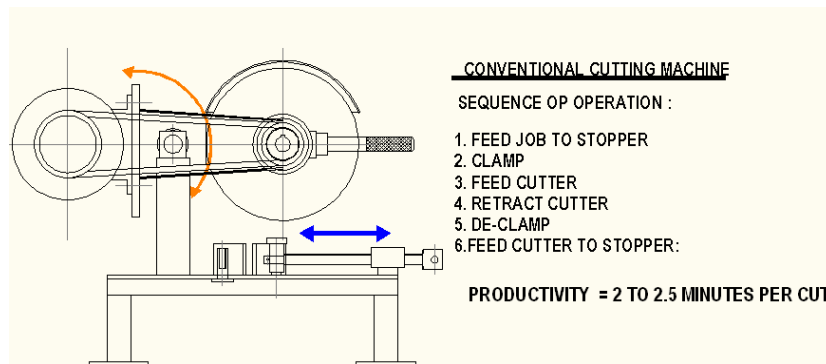


Fig. 4.1 cutting mechanism

In the process of production of any components from steel bar stock, the preliminary process is that of cutting-off of bar stock to length according to the finished size requirements of work piece. This process is normally done by a power hacksaw machine.

The sequence of operation is as follows:

1. Feed bar stock to stopper that is set according to length of work piece to be cut.
2. Clamp the bar stock
3. Feed the cutter blade to cut the required length.
4. Retract the cutter
6. De-clamp the work piece.

CONSTRUCTIONAL FEATURES:

- 1. Cutter motor and cutter head:** Cutter motor is 100 watt motor variable speed 0 to 8000 rpm with a standard 1:3 ratio gear head thus output speed of cutter will be 2600.
- 2. Linear slide and cutter feed arrangement:** Linear slide comprises of two linear motion bearings on either side with guide bars and set of helical compression springs. The feeding action is done by a double acting pneumatic cylinder. Speed of the piston in forward direction i.e. the cutter feed is controlled flow gradual

cutting action using a flow control valve in circuit. Whereas the return stroke is standard (fast action). Springs are provided for fast return of the cutter head to original position.

3. Job clamping and guide arrangement: Job is guided in the job guide whereas the clamping is achieved using a set of clamps namely , the set- clamp (adjustable to accommodate different size of job).whereas the movable jaw is connected to another pneumatic cylinder which is operated in tandem to the cutter feed cylinder.

4. Job Feeding and sensing arrangement: For the semi-automatic version of the machine the feeding action is manual ie, the job is fed in the job guide manually up to stopper. , the proximity sensor is used to sense the job. The sensor then actuates the electrical circuit comprising of an electronic 8-pin relay and push button system..

5. Proximity sensor and electrical circuit Proximity sensor and the electronic relay circuit is a simple electrical circuit used to sequence the operations in the circuit, it can also be replaced by a limit switch arrangement but sensor is more reliable. The circuit decides the on/off of the 5/2 way direction control valve in the pneumatic circuit and thereby the clamping/cutting /return action.

6. Pneumatic circuit: Pneumatic circuit uses two double acting pneumatic cylinders, one 5/2 way direction control valve and one flow control valve, functions of the above components have already being explain above.

V. INDENTATIONS AND EQUATIONS [8]

$$\begin{aligned} \text{Force acting on the rod (P)} &= \text{Pressure x Area} \\ &= p \times (\Pi d^2 / 4) \end{aligned}$$

$$\text{Working Stress} = \text{Ultimate tensile stress} / \text{factor of safety}$$

$$\text{Assuming factor of safety} = 4$$

Now, according to 'LAMES EQUATION'

$$\text{Minimum thickness of cylinder (t)} = r_i \left\{ \sqrt{\frac{f_t + p}{f_t - p}} - 1 \right\}$$

Where,

$$r_i = \text{inner radius of cylinder in cm.}$$

$$f_t = \text{Working stress (Kgf/cm}^2\text{)}$$

$$p = \text{Working pressure in Kgf/cm}^2$$

VI. FIGURE

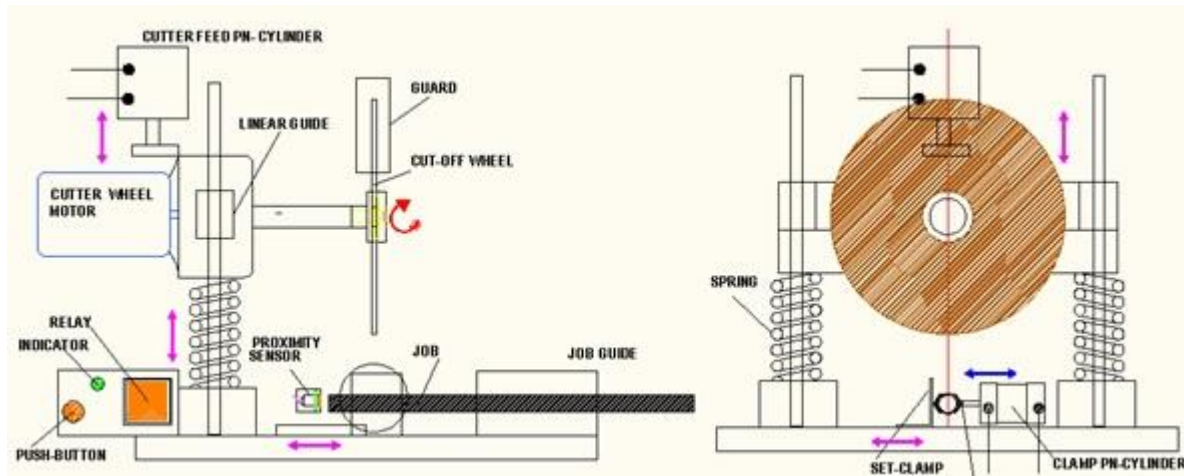


Fig. 6.1 Experimental works

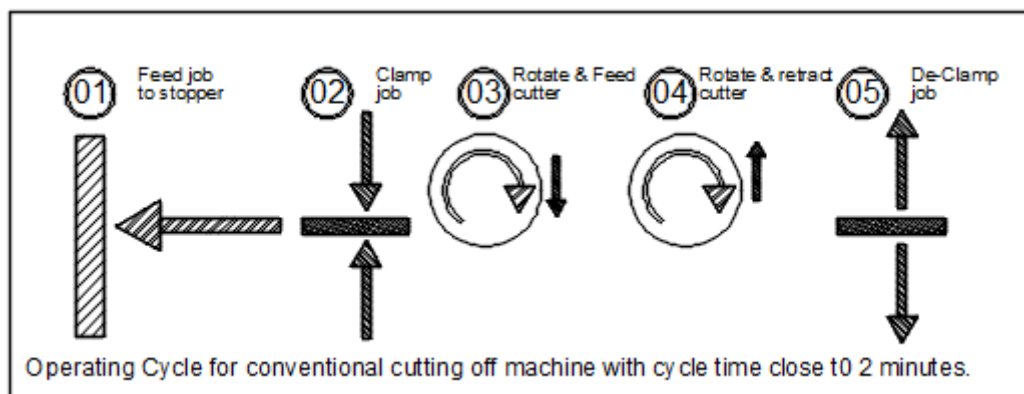


Fig. 6.2 Experimental works direction

VII. ADVANTAGES&APPLICATION

ADVANTAGES

1. Job feeding up to stopper is sensor based so job size accurate.
2. Clamping of bar stock during cutting stroke is automatic
3. De-clamping of bar stock after cutting stroke is automatic
4. Job feeding takes place during return stroke of the machine there by reducing the idle time further.
5. Minimal human intervention only limited to replacing the bar stock on to the machine

APPLICATION

1. Job stock cutting in production of automobile and industrial components.
2. Conduit cutting for wire harnesses used in cars
3. PVC sleeve cutting used as insulating material in electrical machine.

VIII. CONCLUSION

Thus, this work provides an alternative to the existing semi- automatic pipe cutting machine, in terms of semi-automating the pipe entry into the cutting apparatus, eliminates power fluctuation and lesser initial investment. Time consumption is less when compared to manual cutting. This work provides the desired output for automation and fabrication. This machine is very useful for small scale industries.

IX. ACKNOWLEDGEMENT

I would like to express profound gratitude to my guide **Mr. S.S.LANDE** for his invaluable support, encouragement, supervision and useful suggestions throughout this project work. His moral support and continuous guidance enabled us to complete our work successfully. I am grateful for the cooperation and constant encouragement from my honorable Head of Department, **Mr. N.M.SANE** His regular suggestions made our work easy and proficient. Last but not least, I am thankful and indebted to all those who helped me directly or indirectly in the completion of this project report. It is indeed a great pleasure and moment of immense satisfaction for us to present a project report on “*Semiautomatic Pipe Cutting Machine*” amongst a wide panorama that provided us inspiring guidance and encouragement, we take the opportunity to thank those who gave us their indebted assistance. At last but not least we express our sincere thanks to our Institute’s Principal **Dr. J.A.TABOLI** for providing us infrastructure and technical environment.

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