

PNUMATICALLY OPERATED AUTOMATIC PIPE-CUTTING MACHINE

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ABSTRACT

Cutting machine is one of the principal machines in industry. Engineers are always developing sophisticated machines and modern techniques have to be continuously developed and executed for economical manufacturing of products. At the same time, we should take precaution that there has been no negotiation made with quality and accuracy. In the age of automation machine grow into an integral part of human being. By the use of mechanization machine demonstrate itself that it gives high production rate than manual manufacture rate. In competitive race market everybody wants to rise their production & make their machine flexible. The engineer is regularly conformed to the encounters of bringing ideas and design into reality. New machines and methods are being advanced continuously to manufacture various products at cheaper rates and high quality.

So we are going to make a machine for Automatic Pneumatic Pipe Cutting Machine and make it multipurpose & should be used as cutting machine is simple to maintain easy to operate. Hence we tried our ideas and concepts on this research project to cut PVC pipes.

Keyword : - Automation , Pneumatic System, Pipe Cutting, and Compressor

1. INTRODUCTION

The main concern of this system is to carry out three processes Firstly Feeding then Clamping and lastly Cutting . Pneumatic system mechanization is upcoming technology in automation system. Benefit of system is to cut the rod/pipe/cylinder with comfort. The main concern is to regulate the pressure conferring to requirement. The sequenced processes of the system must be accurately timed. The chief work of this system is to slice out huge number of jobs/tasks in rod or pipe form rendering to the batch production. The arrangement of the pneumatic valves deployed in this system is accordance to the circuit planned. The choice of cutter is based on the stress calculated bearing in mind the pipe or rod material. The material favored in this system is a PVC (Polyvinyl Chloride) pipe for demo. But mild steel rods and pipes can also be worked out by using diverse cutter provisions. The cutter to be used in the machine system has been well-thought-out by calculating the torque essential for cutting PVC object by help of the design data offered. With the help of this system the period required to slice the substances like the pipe or rod will be fewer. The accuracy of slicing or cutting of the material will also be enhanced. The system can be controlled and maintained by semi-skilled workers with ease. The design of the machine is compact to be placed in small workshops. The worker during the working of this system should lone turn the switches on/off with the pneumatic valve and gather the sliced pieces.

The price of manufacturing this machine is lesser as compared to other electronic devices used for cutting the job. The whole processes carried out in this section are controlled by air provided by compressor.

2. LITERATURE SURVEY

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 production is carried out for mass production which is aim at reducing the manufacturing cost of a product. Automatic pipe cutting machine is one of the machines use for bulk production and targets at decreasing the human involvement in order to increase the productivity and accuracy of the product. Automatic pipe cutting machine used timer.



Fig -1: Pipe-Cutting Machine

3. TOOL GEOMETRY

3.1 Pneumatic Cutter Motor Design

Pneumatic cutter motor design-

$$1 \text{ inch} = 25.4 \text{ mm} = 2.54 \text{ cm} = 0.0254 \text{ m}$$

Given Specifications: $N=22000$ RPM.

$Q=10 \text{ cfm}$ = cubic feet per min of air.

$$=14 \text{ lit/hr.} = 10 \times (12 \times 0.0254)^3 = 0.28316 \text{ m}^3/\text{min.}$$

$P=0.5$ hp.

max. Collet \varnothing 6mm.

Geometric displacement of motor (V_i) is volume of air displaced by motor in one revolution.

V_i = Geometric displacement of motor mm^3 .

N = Speed of motor in rpm.

$$\text{Volume flow rate of air (Q}_i\text{)} = \frac{V_i \times N}{60}$$

$$0.28316 = \frac{V_i \times 22000}{60}$$

$$V_i = 7.7225 \times 10^{-4} \text{ m}^3/\text{s}$$

$$\text{Power of Pneumatic motor } P_i = \frac{2\pi NT}{60}$$

$$0.5 \times 746 = \frac{2\pi \times 22000 \times T}{60}$$

$$T = 0.1619 \text{ N-m (Required Motor Torque)}$$

3.2 Pneumatic Cylinder

The vital part in this system is the pneumatic cylinder whose task is to relocate the cutter vertically upward and downward in accordance to the pressure provided. The selection of the cylinder based on the pressure range attained from the forces eliminated for cutting the PVC material.

Following are the specifications for the cylinder chosen:

Parameters consider during the design of cylinder.

Piston Diameter (mm): 32, 40,50,63,80,100

Std. Stroke(mm) : 25,50,80,100,125,160,200,250,300,320.

Medium : Compressed air-filtered-lubricated

Medium Temperature: 5°-60°1c

Working Pressure : 0.5-10 bar

Considering Double Acting Cylinder of,

Piston Dia. (D) = 50mm

Stroke Length (L) = 50mm

Diameter of Rod (d) = 20mm



Fig -2: Pneumatic Cylinder

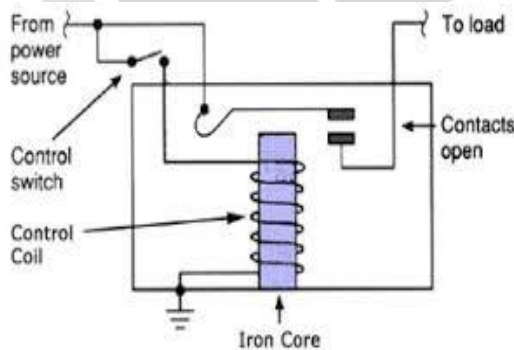
3.3 Switches and Power Relay

A switch is an electrical device that can make or break an electrical circuit, disturbing the current or directing it from one conductor to other. Switches are used to handle a widespread range of voltages and currents. Very large switches may be used to separate high-voltage circuits



. Fig -3: Electrical Switches

A relay is an electrically functioned switch. Numerous relays use an electromagnet to mechanically control a switch. Relays are used where it is required to control a circuit by a low-power signal with whole electrical isolation between control and controlled circuits or where some circuits must be controlled by single signal.



. Fig -3: Power Relay

3.4 Flow Control Valve

Flow Control Valve used in this system is variable type flow control valve. There are three valves used.

3.5 Pipes

Pipes used in this system are of varying diameter from 5mm to 10mm as per the change pressure in certain area.

3.6 Tee Used

They are used in order to provide multiple connections.

4. CIRCUIT DIAGRAM USED FOR THE SYSTEM OPERATION

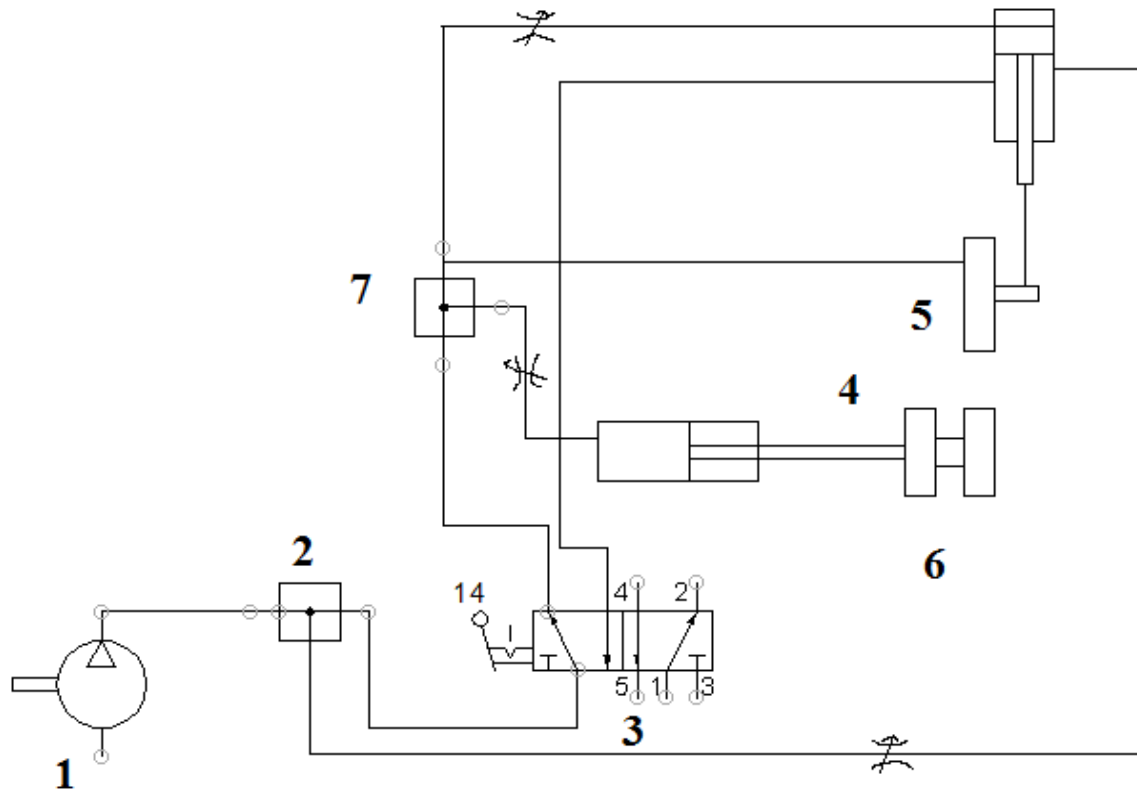


Fig -3: Circuit Diagram used in System Operation

Labels used in the figure:

- 1) Compressor
- 2) Tee
- 3) 5/2 DCV
- 4) Cylinder
- 5) Cutter
- 6) Clamber

5. ACKNOWLEDGEMENT

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