

A Review Paper on “Automatic Pipe Feeding and Cutting Machine”

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Abstract— For the purpose of reducing human effort for repetitive work of cutter pieces of pipes as well as providing a convenient fixture to support and hold the pipes/rods during cutting. The subject is considered as a part of B.E mechanical project. It can be termed as advanced machine. There are many industrial applications where different types of pipes are required to be operated on different machines to make machine components such as Shafts, Bolts, Screws, etc. This needs one and more number of pieces to be cut for mass production. The bar feeding mechanism is a metal cutting machine tool designed to feed the metal. The structure is exclusively intended for the mass production and they shows faster and more efficient way to feed the metal. The clamping arrangement can be changes according to need of operations suitable. The total structure is compact in size, light weight, modular and flexible to be used in small works jobs which needs batch production. The system even has the potential to add up a PLC system to control its overall working with ease and with less effort provided. This system has the potential to adopt higher level of automation if desired in future.

Keywords: Structure, Feeding Mechanism, Automation

I. INTRODUCTION

In engineering, many processes are required and different parts require different processes. But the properties of materials and other things changes with the processes. Due to the entrance of the multinational companies this caused to increased demand special purpose machine and use of scientific techniques to compete with the national companies. This caused the invention this machine increasing the productivity, reduce the cycle time, sets up the costs, use of high skilled workers. Following Fig.1 shows the prototype block diagram.

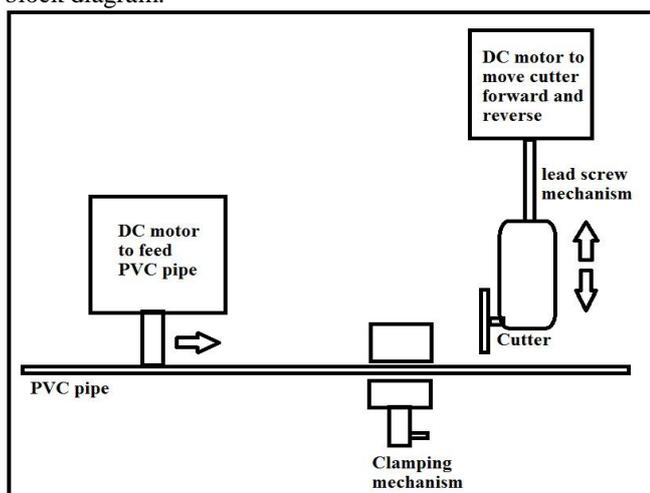


Fig. 1: Block diagram of prototype

The Portable Multipurpose P.V.C. cutting machine is Driven by the ½ H.P torque motor, which has speed around 100 rpm. The gear drive is used for transmitting power from motor to shaft by which the longitudinal motion is given. The

conventional machines, which are present now-a-days in the market is not having the arrangement of self mobility. Our Portable Multipurpose P.V.C. cutting machine moves by it’s own using electric motor drive. The another electric motor used is high torque motor having 0.5h.p. rating and ability to carry the tool weight also of one person of 65kg weight for some moment . Here the moment duration for which the machine has to be motioned is small because for more time the machine is providing the cutting operation.

II. PROBLEM STATEMENT

Design and develop a prototype model showing the concept of automated pipe cutting machine by using a mechanical mechanism incorporating the D.C. Motor for the required torque generation. Also fabricate the model of the same which will show automatic PVC PIPE feeding.

III. LITERATURE SURVEY

- 1) The literature review has been carried out for finding the various parameters and studying the existing literature on this machine according to prof.J.P. Wagh et al.(2016),has studied the sensor based cutter and concluded that by changing the location of cutter the machine is better utilized according to P.Ballashanmugam et al.(2015) had studied the design and fabrication of manual cutting machine and had explained the need of automatic. According to K. Krantikumar et al.(2016) had identified that the pneumatic sharing machine is very cheap as compared to hydraulic sharing machine also it is more suitable to sheet metal cutting. According to Rushikesh Gadale et al.(2015) had explained the importance of automation in cutting machine and has studied the cutting machine based on PLC. This machine has faster execution time and is more efficient in working. Thus, from above literature review have studied the various cutting machine and used the data for automating the cutting machine.
- 2) From this journal we get the actual idea of pipe feeding mechanism. Meghani P..D. guided about the conventional feeding mechanism used in industrial applications Jaiswal A. describes which types of motors are used for feeding mechanism .Jain N. and Borse M. described feeding mechanism using rollers via spur gears.
- 3) The wast review of literature will help to concepts, theorems and different factors affecting the performance of machine. R.S.Khurani, J.K Gupta in their book “Theory of machines” (velocities in mechanisms) helps to find velocity diagram of slider crank mechanism. [3]

IV. PRESENT WORK

A. Components of the System:

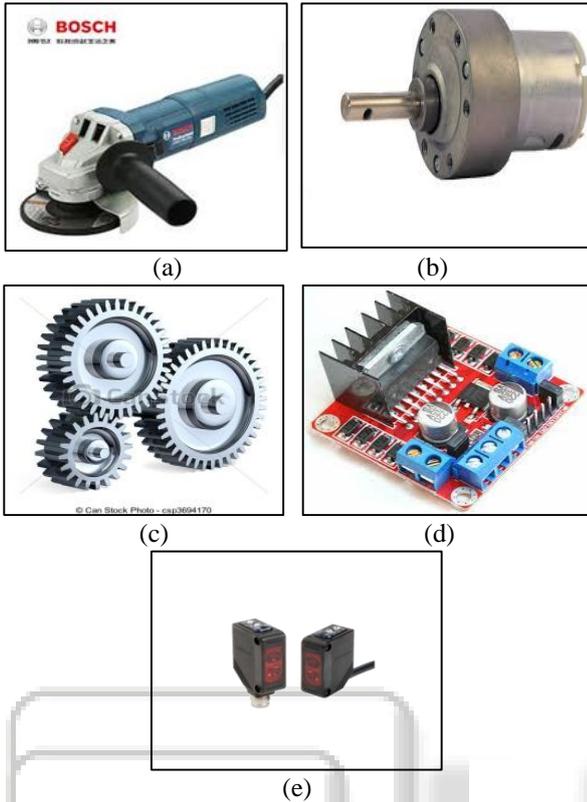


Fig. 2: (a) Cutting Machine (b) Motor (c) Spur gears (d) Motor Driver (e) Photoelectric Sensor

In the present design clamping pipe is done in roller mechanism by using DC motor. Various components of the system are shown in Fig.2 (a) to (e). Cutting operation is done by DC motor which is control by control circuit that will cut the pipe automatic. Feeding done by roller mechanism the roller is rotates by DC motor. For measuring the pipe length by using photovoltaic electric sensor. By using this method cost of labour is reduced. Actual mechanism is as shown in Fig.3.



Fig. 3: Automatic Pipe Cutting Machine

V. DESIGN CALCULATION

A. Design of Motor for Driving Lead Screw

First consider the rotary motor weight
Then consider frame weight.
Total weight = rotary wt. + frame weight
Answer is calculated in kgs

Let the torque on one side of the arm = T_a , Nm
Total Torque, $T = 2 \times T_a$
 $= 2 \times \text{total wt.} \times g = (\text{Nm})$
 $P = (2 \pi N T) / 60$
 P is calculated in W or hp
we have to select the standard motor.

B. Design of Feeding Motor

Let the torque on one side of the arm = T_a , Nm
Total Torque, $T = 2 \times T_a$ (Nm)
 $P = (2 \pi N T) / 60$
 $P = W$ or hp
we have to select the standard motor for feeding.

C. Design for Lead Screw

$$T_{\text{raise}} = \frac{F d_m}{2} \left(\frac{l + \pi \mu d_m}{\pi d_m - \mu l} \right) = \frac{F d_m}{2} \tan(\phi + \lambda)$$

Where

$$T_{\text{lower}} = \frac{F d_m}{2} \left(\frac{\pi \mu d_m - l}{\pi d_m + \mu l} \right) = \frac{F d_m}{2} \tan(\phi - \lambda)$$

- T = torque
- F = load on the screw
- d_m = mean diameter
- μ = coefficient of friction (common values are found in the table to the right)
- l = lead
- ϕ = friction angle
- λ = lead angle

VI. CONCLUSION

Thus, this work 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. Time consumption is less when compared to manual cutting. This work provides the desired output.

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