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Design & Development of Automatic Stamping & Pad Printing Machine

Ganesh B. Jangale[1], Prasad R. Malode[2], Prof.Amit.J.Somwanshi[3]

[1] BE Student, Department of Mechanical Engineering, Matoshri College of Engineering& Research Center, Nashik.
[2] BE Student, Department of Mechanical Engineering, Matoshri College of Engineering& Research Center, Nashik.
[3] Professor, Department of Mechanical Engineering, Matoshri College of Engineering & Research Center, Nashik.

Abstract-*An engineer is always looked towards challenges of bringing ideas and concepts to life. Therefore, sophisticated machines and modern techniques have to be constantly developed and implemented for economical development of products. Similarly, we should take care that there has been no compromise made with quality and accuracy. In the age of automation machine become an essential part of human being. By the use of automation machine prove itself that it gives high production rate. In competitive market everyone wants to increase their production & make their machine multipurpose. The engineer is continuously conformed to the challenges of bringing ideas and design into reality. New machines and techniques are being developed continuously for manufacturing various products at low rates and effective quality.*

So we are going to make an automatic stamping & pad printing machine for punch or emboss the machine components names, symbols and other printing work. This machine is simple to maintain, easy to operate to fulfill the requirement of today's automated plants. Hence we tried our hands on "Design and Development of automatic stamping & pad printing machine" is one of the principle machines impress & printing industry. It is mainly used as the name indicates to use for embossing processes.

I. INTRODUCTION-

Printing & embossing is a process of making text and images using a master form or template. Modern large-scale printing & embossing is typically done using a printing press, while small-scale printing is done with a digital printer. Although paper is the most common material, it is also frequently done on metals, plastics, cloth and composite materials. On paper it is usually carried out as a large-scale industrial process and is aneedful part of printing.

II. OBJECTIVE

1) To reduce the power consumption during machining.

2) To maintain the accuracy in production.

3) To develop automation unit, so that machine can easily be adopted in today's automated plants.

4) This type of machine provides work practically at low cost, low maintenance, low capital investment in less space.

5) To perform the most rigid operation with high speed.

III. DESIGN CALCULATIONS

3.1Design of Pneumatic Cylinder

Clavario's equation is used for closed end cylinder for both the end. Thus ductile material is used for determine thickness of cylinder. Let, Aluminum is the material used for design of cylinder.

$$t = ri \left[\sqrt{\frac{\sigma t + (1 - 2\mu) P}{\sigma t - (1 + \mu) P}} - 1 \right]$$

S_{ut} =Ultimate tensile strength = 200N/mm^2
μ = Poisson's Ratio for the cylinder material =0.29 (std.)
di = Inner diameter of cylinder =40mm
Consider,

Double acting cylinder Ø40 X 80 (Diameter X Stroke)

ri =20mm

By assuming pressure in working cylinder is, P = 3 bar =0.3 N/mm^2

So according to Clavarino's equation,

For closed end cylinder at both ends to determine the thickness of cylinder.

Assume,

p = 3 bar = 0.3 N/mm^2

μ = 0.29

r_i= 20 mm.

$$t = ri \left[\sqrt{\frac{\sigma t + (1 - 2\mu) P}{\sigma t - (1 + \mu) P}} - 1 \right]$$

$$t = 20 \text{ x } \left[\sqrt{\frac{200 + 0.3 [1 - (2 \text{ x } 0.29)]}{200 - 0.3 (1 + 0.29)}} - 1 \right]$$

t = 0.048 mm.

By considering Factor of safety FOS =1.5

t=1.5 x0.048 mm. =0.07318 mm.

Available thickness, t = 0.5mm

Piston diameter = 40mm

Stroke diameter = 80mm

Piston rod diameter = 12mm.

Let,

A= Force area of cross-section of piston.

$A= \frac{\pi}{4} (D^2)$ mm^2

$A= \frac{\pi}{4} (40^2)$ mm^2

A= 1256.63mm^2

A_{PR}= Force area of cross-section of piston on rod side.

$A_{PR}= \frac{\pi}{4} (D^2 - d^2)$ mm^2

$A_{PR}= \frac{\pi}{4} (40^2 - 12^2)$ mm^2

A_{PR}= 1143.54mm^2

Time required to complete stroke is 2 second.

Linear velocity of piston $V=\frac{L}{t}$

$= \frac{80}{2}$

= 40 mm/sec.

Piston force acting during forward stroke.

$F_{a= P X} \frac{\pi}{4} (D^2)$

= 0.3 X 1256.63

$F_{a =}$ 376.989 N.

Piston force acting during return stroke.

$F_{R= P X} \frac{\pi}{4} (D^2 - d^2)$

= 0.3 X 1143.539

$F_{R =}$ 343.0617 N.

IV. CAD DRAWING FOR MACHINE:

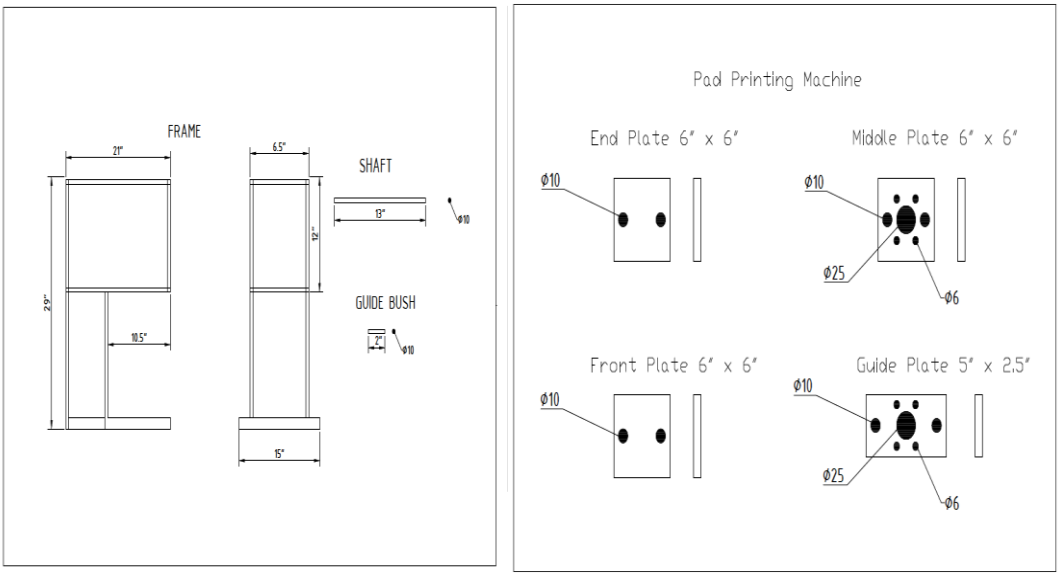

Figure 1: AutoCAD drawing of frame, shaft, guide bush&diffrent plates

V. WORKING

There are three modes which the machine performs for doing its operation

1) Manual mode

2) Single Auto mode

3) Continuous Auto mode

1) Manual mode

By pressing 1 manual mode is selected. Pressing * button the machine gets start. By number 5 button the first piston moves downward from its initial position and collects the ink from inkpad. Again pressing the same number 5 the piston moves upward. Now by pressing number 4 the second piston moves downward the punches the ink on work piece. Same number is used to move the piston upward again. The first piston moves backward to its initial position by number 5. In this process the # button is to stop the manual mode.

2) Single Auto mode

Number 2 button is for Single Auto mode. And by pressing * button the machine starts working automatically and punches on the work piece for only single operation. After that the machine stops. The # button is to cancel the mode.

3) Continuous Auto mode

Number 3 button is to select the Continuous auto mode. By pressing * button the machine starts working automatically and performs the operation continuously. By pressing # button the machines stops and cancel the Continuous auto mode.

Figure 2: Fabricated Machine

VI. CONCLUSION

By using references we formulated design calculation for various parts of automatic stamping and pad printing machine. We developed automation unit, so that machine can easily be adopted in today's automated plant. We develop a machine that provides work practically at low cost, low maintenance, low capital investment. Because of modification in existing machine accuracy of production and performance of the machine increased with high speed.

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