A REVIEW PAPER ON AUTOMATIC PNEUMATIC BAR BENDING MACHINE

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Abstract- Now a days the world is focusing into automation. Each and every work of human is reduced by a machine, but few areas like construction the usage of machines for bending rods for stirrups which are used to withstand loads in beams and columns are not done by machine because the cost of machine is high and need skilled labors to operate it. In this paper is aimed to do bending operation for stirrups using pneumatic and named as pneumatic rod bending machine. The main objective of our paper is to implement the pneumatic rod bending machine in the construction sites with less cost compared to the existing bending machines, and increasing the productivity of the stirrups. Pneumatic rod bending machine consist of Pneumatic cylinder, Compressor, Hoses, Pulley, Cutting blades, Fixture, Electronic circuits, Switches and wiring .The rod is bent by the Pneumatic cylinder piston with holding the rod in the fixture. The main advantage of our paper is the square shape of the Stirrups is bent continuously without repositioning the rod in the machine

Keywords: bending operation, pneumatic system, Stirrup, manual stirrup making, fixture.

I. INTRODUCTION

Since long time ago the labour work has essential role in constructions including mixing coarse aggregate-sandwater- cement, ramming sand, land levelling, and digging the foundation for base of structure, cutting rod in required length, rod bending and pouring the mixture of concrete in columns and beams. Now days, due to development in technology it is required to reduce the labour work and time since there are lot of available resources. As population increasing very rapidly, demand of the construction to build the buildings for industries, overhead bridges, human livings and population is continuously increases. Several problems come in to the picture when we consider human work with respect to automation. By using conventional method it is not possible to reduce construction time and building it as early as possible. So, Automation in construction system

II. Literature review

- Thokale Manoj et al. [1] have In latest attempt a successful solution for the manual stirrup making is obtained. By using various fixtures in the table we can able achieve different shapes and sizes of the stirrups. The system can be handled by any operator very easily. Since it is cheap and simple design this machine can be sell to anywhere across the nation. Advance bar bending machine use for mass production. By using advance bar bending machine increases production rate and reduce labour cost.

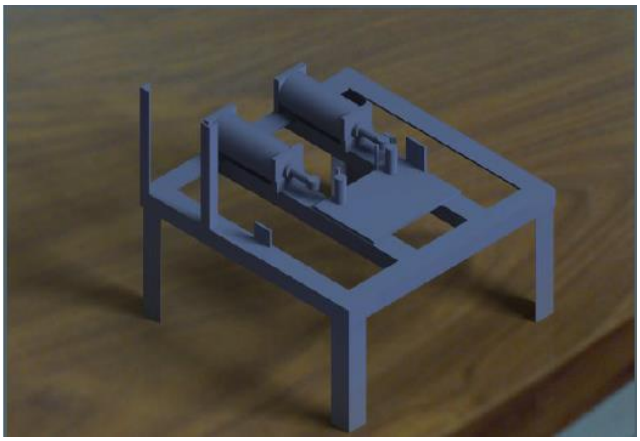


Fig.1 Solid cad model

Fig of pneumatic system

- Vijay pal et al The manually controlled press is converted into automatic machine by which maximum operating time will be saved. Thus the output will be more. In this project the human intervention is for loading and unloading the plate. It may be called as semiautomatic machine. This machine can be converted into a fully automatic machine where loading and unloading of the plate can be done automatically. To conclude, this study is made keeping in mind that any manually operated machine can be converted to automatic machines by using pneumatic, electrical and electronic devices. For these purpose one should have the full knowledge on how the devices are being used. By doing so the existing old machines can be modified and made automatic by which the initial cost, to procure new automatic machines may be minimized. Thus there is a lot of scope in this area (automation).

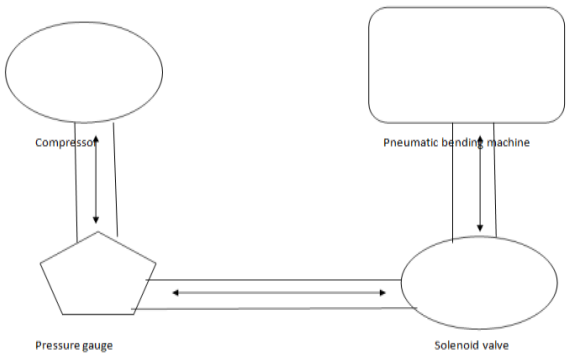
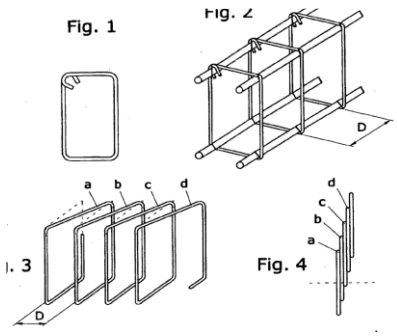


Fig: 2 block diagram of pneumatic system

Fig. 3 Pneumatic cylinder

Pneumatic cylinder
Type-Single acting cylinder
Diameter = bore diameter =25mm
L=stroke length = 100mm
Max. Supplying pressure = 10kgf/cm2
Max.Operatingpressure = 5-8kgf/cm2

- R.Vigithra et al.(1)In latest attempt a successful solution for the manual stirrup making is obtained. By changing the fixture in the table we can obtain various sizes of the stirrups. Instead of complicated designs the simple kinematic system is used. The system can be handled by any operator very easy Due to low cost and simple design this can be marketed to any of the nation



Working Principle

Place the bar at work holding part in attachment with Main die in stirrup making m/c
On energizing the drive motor, the power will be transmitted from the motor to stirrup die axle shaft through chain drive.
It means that power will be transmitted from driving sprocket to the driven sprocket with calculated speed ratio as to get high torque to drive the bar loaded die.T α (1/N)
Main die and forming die rotates in opposite direction with the help of idler sprocket.

- A.D. Zope et at (1) We are going to design and develop metal bending machine i.e. a sheet and pipe roller with the help of a hydraulic bottle jack and rollers as shown in fig.(1). It consist three rollers.One roller is at the upper frame and another two rollers are at the lower frame, and with the help of bottle jack force we will bend the metals. It has 2 MS square pipe frames one is fixed horizontally and one is vertically.At horizontal frame consist pedestal bearing through which shaft or roller is rotates easily. At horizontal frame have two rollers at parallel. And at vertical frame carries also one pedestal bearing and one roller through it. Hydraulic bottle jack is used to give motion to vertical frame by which we can apply gradual load while bending. Sheet is feed from these rollers, because of handlemovement;this sheet is passed from rollers by rolling motion. We have to rotate handle by manually which is attached at roller of vertical frame.

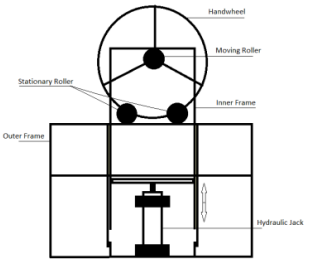


Fig. 4 metal bending machine

III. DESIGN CALCULATIONS

Force :- Diameter of Rod = 8 mm
Material – Mild Steel
Allowable bending stress ( ) =300 N/mm2
Force required to bend rod –

$$\frac{M}{I}=\frac{\sigma_b}{y}$$

We know that Bending moment is given by,

M=F*L

$$F=\frac{([\sigma_b \times I])}{L\times y}$$

Where

$$I=\frac{\pi}{64}D^4$$

And D= 6mm

$$F=\frac{([\sigma_b\times\frac{\pi}{64}D^4])}{L\times y}$$

$$F=\frac{([300\times\frac{\pi}{64}6^4])}{10\times 4}$$

F=1508 N This is the force at which rod is just start to bend So selected force = 1508N

Pneumatic cylinder design- We know pressure is given by

$$P = \frac{F}{A}$$

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

So,

Assume pressure is constant at 5 bar

$$P = \frac{1508}{\frac{\pi}{4} D^2}$$

D = 0.06296 m

D = 62.96 mm

Select standard cylinder diameter as 63 mm

Impact Factor value: 5.181

Stroke Length: Minimum Bending length of bar = 100 mm

Clearance between striker and

Rod dia=20mm

Cylinder Stroke length = bending length + clearance

= 140 mm + 40 mm = 180 mm

Select standard length is 200 mm.

Fig. 5 Piston cylinder

IV. Selection of timer

A. Functional Specifications

Modes Cyclic ON first or OFF first

Time Ranges 0 - 1 sec / min / hr (ON Time)
0 - 10 sec / min / hr (ON Time)
0 - 1 sec / min / hr (OFF Time)
0 - 10 sec / min / hr (OFF Time**)**

B .Supply Voltage

Supply Voltage 20 to 240V AC (50 / 60Hz)
12 to 240V DC

Power Consumption 2VA max

C.Environmental Specifications

Temperature Operating: 0 to 50C (32 to 122F)

Storage: -20 to 75C (-4 to 167F)

Humidity (non-condensing) 95% RH

Weight 110 gms (0.242 lbs)

Protection Level IP50 for faceplate
IP40 for housing
IP20 for terminals

Fig. 6 Timer 800XC

V. Conclusions

The manually controlled press is converted into automatic machine by which maximum operating time will be saved. Thus the output will be more. In this project the human intervention is for loading and unloading the bar. It may be called as semiautomatic machine. This machine can be converted into a fully automatic machine where loading and unloading of the bar can be pass automatically. To conclude, this project is made keeping in mind that any manually operated machine can be converted to automatic machines by using pneumatic, electrical and electronic devices . Thus there is a lot of scope in this area (automation).

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