Design and Fabrication of Automatic Bar Bending Machine

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Abstract- **In present time the automation in all the fields of work and reduce the human effort and reduce time consumption in work place by using automation or by machine is used. They worked on Design and Fabrication of Stirrups Making Machine and they concluded that Since testing the stirrup making machine it is observed that how much time is required to make single piece of stirrup by effective working ways.**

Index Terms- **Angle Bending operation; formatting; Future benefits; Stirrup making by using particular mechanism of crank and slotted quick return mechanism.**

I. INTRODUCTION

Since long time ago the labour work has essential role in constructions including mixing coarse aggregate-sand-water-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 is requires.

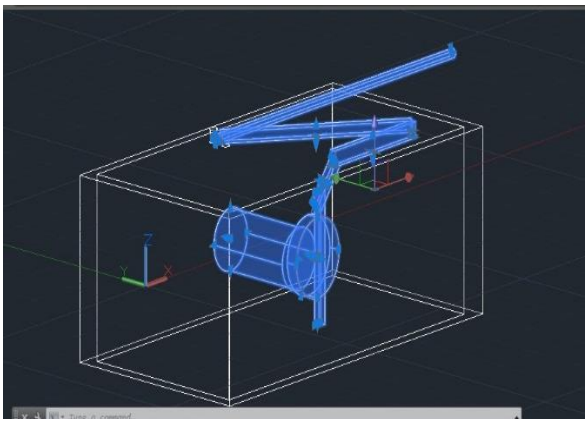


Fig. Cad model of automatic bar bending machine

II. LITRATURE SURVEY REVIEW

1.Vilas Shinde, Darshan Adhav, Suraj Jadhav, Afsar Attar, Sandip Gorde et. al. [1], *"Design and Fabrication Of Hydraulic Stirrup Making Machine"* They worked on Design and Fabrication of Hydraulic Stirrups Making Machine and they concluded that Since testing the stirrup making machine it is observed that how much time is required to make single piece of stirrup by effective working. The detail description is given as below: Loading and unloading combining clamping the bar to fixture it almost takes only 5 to 6 seconds. Time required to forward and backward stroke is about 10 to 11 seconds during which stirrup is made. Considering machine ergonomics that is interaction of human operator with machine, it is very easy to operate it because operating switch is provided at suitable place of machine. Again loading and unloading is not complicated since not very specialized tooling is used it is very simple structure.

2. I Muhammed, S.Ravivishwnath, P Sureshkumar, N. Sarvanan Design and fabrication of hydraulic rod bending machine, April 2014. Worked on design and fabrication of rod bending machine and they concluded that 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 labours to operate it. So this project is aimed to do bending operation for stirrups using hydraulics and named as hydraulic rod bending machine. The main objective of our project is to implement the hydraulic rod bending machine in the construction sites with less cost compared to the existing bending.

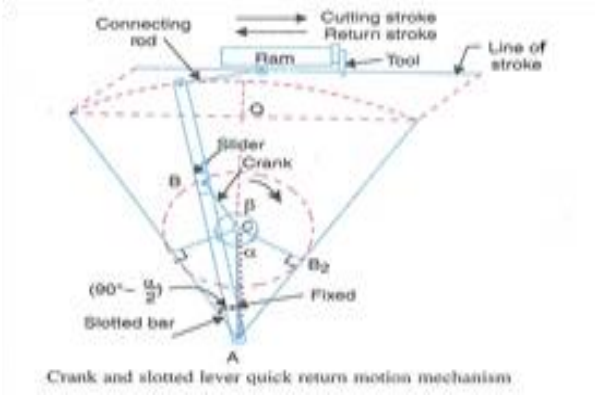
III. CONSTRUCTION

It consist of crank and slotted quick return mechanism, a three phase electric motor of 1 HP which rotates at a speed of 1440 rpm.and runs at an alternating current., a helical type gear box of gear ratio 105 and input shaft diameter of 29mm and output shaft diameter of 24mm. Also consist of two pulleys of B section of which diameter of driver pulley is 27.5mm and diameter of driven pulley 137mm with center to center distance of 410mm with V-belt drive of length 1177.6mm and has a specification of B43. single slider crank chain mechanism, and bending mechanism. Where crank and slotted lever quick return mechanism consists of circular disc of diameter 300 mm which performs the operation of crank, slotted lever of length 400 mm breadth 65 mm and thickness 8 mm with slot of dimension length 305 mm breadth 16 mm and thickness 8 mm. connecting link of length 240 mm and breadth 65 mm and thickness 8 mm, ram reciprocates in ram casing of length 566 mm. single slider crank chain mechanism consist of slider casing of 566 mm, slider reciprocates in slider casing, connecting rod of length 566 mm, and crank of 350 mm. The bending mechanism consist of arrangement of fixtures which is used to bend the bar.

- MOTOR SPECIFICATION

Maximum Power	1HP @ 1440 rpm
Maximum Torque	4.94 Nm

IV. WORKING MECHANISM



Crank and slotted lever quick return motion mechanism

- WORKING :

As the electric current (Alternate Current) is supply to the electric AC motor. The machine start and power is supplied to the Gear box with the help of V-belt drive which reduce the speed upto some extent, and then gear box reduces the speed with Gear box ratio of 105.

The circular wheel rotates at reduced speed which is coupled to the gear box. this rotary motion is converted into the reciprocating motion with the help of crank and slotted lever quick return mechanism. The reciprocating motion is obtained in two strokes Forward stroke also called as working stroke, and another is return stroke called as idle stroke.

This reciprocating motion is utilized to bend the bar with the help of mechanical linkages formed four bar mechanism.


Fig. Bar Bending machine setup

V. CALCULATION

- Torque Available from motor $= \frac{P*60}{2\prod N}$

$= \frac{746*60}{2\prod*1440}$

$=4.94$ Nm

➢ Forces acting on mechanism

Torque = force * perpendicular distance

4.94 Nm = force * 0.3

Force = 16.46 N

Assume 90% mechanical efficiency

Force acting on slider or ram

Force = 16.46 * 0.9
= 14.81 N

Now force acting for bending

Work input per unit time = work output per unit time

F1 * V1 = F2 * V2

14.82 * 0.204 = F2 *0.288

F2 = 10.49 N

➢ V-Belt speciation:
Smaller pulley diameter = 27.5 mm
Larger pulley diameter= 137 mm
Center to center distance= 410 mm
Angle with horizontal= 5
Speed= 1440 rpm
Leather belt
B- Section pulley of no.43

VI. OBJECTIVE

- To make a bending machine to bend a metal bar up to 20mm.
- Analytical design of "Automatic bar bending machine"
- Modelling and simulation of "Automatic bar bending machine"
- Preparation of prototype sample of "Automatic bar bending machine"
- Experimental workout of "Automatic bar bending machine"
- Study of comparative result of "Automatic bar bending machine"

VII. ADVANTAGES

- Bending is a cost effective process when used for low to medium quantities.
- It reduced Human efforts.
- System can be operates by operator easily.
- No skilled labour is required for operation.
- It reduces costing of labour as there in no labour skill is required.

VIII. APPLICATION

- It is mostly used in building Construction work to make the structure of column.
- Specially used to make stirrup.

IX. CONCLUSION

In this project we are concluded that as day by day there is more requirement of skilled labour because of faster rate of development in construction filed or area hence to reduce human effort and to reduce working time for construction operation we have developed automatic bar bending machine for production of stirrup which plays an important role in constructing structure of column.
Our machine makes stirrups automatically with the help of quick return mechanism and slider crank mechanism and V belt drive is used to transmit the power

REFERENCES

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