

Solid Bar Bending Jig using Embedded System

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Abstract: - This paper show the low cost solid bar bending mechanism (jig) using embedded system. In conventional method manually bar bending is done with the help of the man power in small scale industries. Here describe designing method of bar bending jig with the help of microcontroller and 3 phase induction motor mechanism at low cost and very low maintenance with high robustness for small scale industries.

Key words—microcontroller, solid bar, induction motor, direction control.

I. INTRODUCTION

There is often requirement of solid bar to bend in particular angle. So in conventional method solid bar is heated and then help of hammer it is blended. Without heating of bar it is not possible to bend it in required shape. But in big industries, Computer operator machines are present to bend any bar, pipe and C-channel of various size. But in small scale industries it is problem to bend bar or pipe with help of man power. It is also very costly and time consuming.

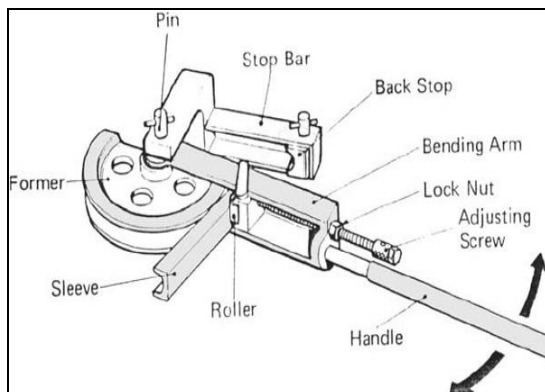


Figure 1. Manual jig for bending pipe.

To overcome above problem there is some mechanism to bend bar or pipe which is controlled by microcontroller. In this mechanism 3 phase induction motor with Gearbox mechanism to solve speed problem and microcontroller with sensing circuit

Which sense the position of motor. It is cost effective and very low maintenance system for bar or pipe bending.

In this paper section II contain block diagram of system and section III introduce the embedded system. Section IV contain conclusion.

II. DESIGNING METHOD

Here we discuss manually bending method and how to bend a pipe in a particular degree. Shown in Figure 2.

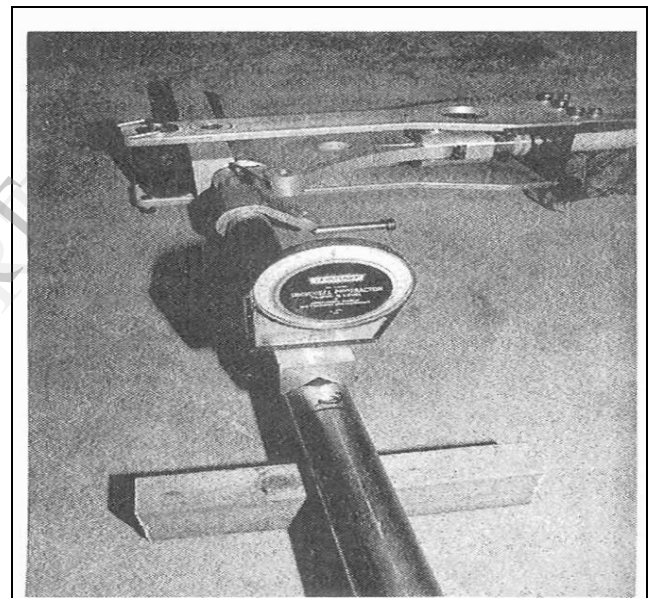


Figure 2. Manual diagram for pipe bending.

Here after cutting the pipe we are ready to prepare for bend. I used one of the popular ram type tubing benders and placed the tube in the bender such that mark indicating the start of the bend aligns with where the bending die begins to curve. 2X3 helps to hold the ends of the tube up and a small "V" block has been clamped to the tube at an angle of zero degrees on universal protractor.

Shown in Figure 3 the sample pipe is be bend with help of man power but here 1 loss is that we required 3 to 4 man for move jig for bend pipe. So after we face this problem and we convert this machine on the embedded. We will discuss later here

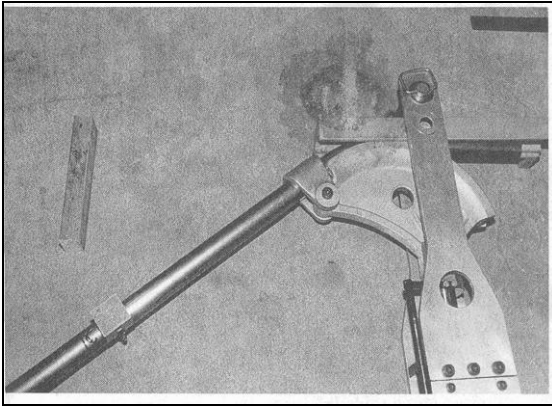


Figure 3. Pipe bended

There is some mechanical arrangement which work as bar bending jig. Figure 4 shows the block diagram of the whole system. Here microcontroller circuit is used to control the direction of the induction motor for automatic bending of bar or pipe. Here gearbox is used to decrease speed and also to get high torque. There is some mechanical arrangement connected to gearbox which is used to band bar and pipe also. Proximity sensor is used to detect the position of motor shaft and also for bending angle detection. All mechanism controlled by induction motor and direction of motor controlled by microcontroller.

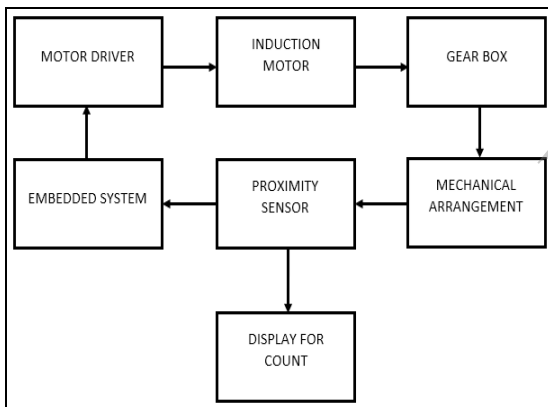


Figure 4. Block Diagram of the bar bending mechanism.

III. EMBEDDED SYSTEM

The Embedded contain main microcontroller circuit and also sensor driving circuit. Figure 5. Shows complete block diagram of embedded system.

In embedded system main part is microcontroller (AT89C51) which control all mechanism.[4] Here position of motor shaft and mechanical arrangement connected to shaft is sensed by two proximity sensor. one proximity sensor for forward direction and other proximity for reserves direction of motor. Then signal fed to the microcontroller that drive relay diver circuit according to signal generated by proximity sensor.

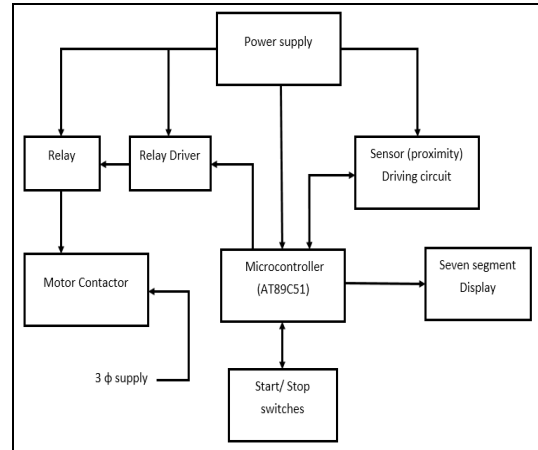


Figure 5. Block diagram of Embedded system.

Relay operat the 3 phase contactor of motor and change direction of it according to sensing signal. Agale of bar bending is decided by position of proximity sensor. Seven segment display is used to indicate counting of bends in bar or pipe. Programming of Microcontroller is done in keil software.[5]



Figure 6. snapshot of Embedded system.

Figure 6 shows the snapshot of circuit. In snapshot bulb is taken as load instead of motor. Two contactor are shown for different direction of motor.

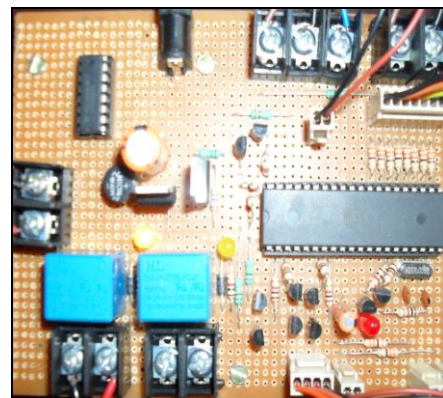


Figure 7. snapshot of microcontroller Circuit.

IV. CONCLUSION

After that we made this experiment we conclude that we easy to bend we do not required so much man power. And we also got the mass production in a day. Small scale industries required production so it's very useful to automobile industries and small scale furniture items.

Here we got the benefited in cost wise and maintenance wise as well as installation.



Figure 8. Machine jig for bending.

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