SEMI-AUTOMATIC TUBE BENDING MACHINE

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ABSTRACT

Bending machine is a common tool in machine shop that is used to bend a metal. It is widely used in various industrial operation such as bending a tube in required shape & size. As small-scale industries cannot afford expensive machines, and since automated tube bending machines are available at high prices, it makes them very difficult to bend tubes with accuracy. Hence our project deals with the semi-automatic tube bending machine. The machine is compact in size, portable and available in affordable price. It will be reduced human effort and also a semi-skilled labor will be able to operate it.

Keyword: - *Bending Machine, Small Scale Industries, Affordable.*

1. INTRODUCTION

Bending is a process by which metal can be deformed by plastically deforming the material and changing its shape. The material is stressed beyond the yield strength but below the ultimate tensile strength. The surface area of the material does not change much. As the name suggests this project is about design and fabrication of a machine that is used for bending of tubes. In various fabrications of works as well as in architectural work tubes are used in artistic ways. To bend these tubes into the artistic forms is not easy thing to be done manually. Using a particular machine specially developed for bending of tubes helps. In this advance industry tube bend are having wide range of applications fields like aerospace, structures, trusses, and automobile industries etc. This machine is used to bend metal tubes into curve and the other curvature shapes. The size of machine will be very convenient for portable work. Moreover, it will be easy to carry and use at any time and any place. It will be reduced human effort and also requires low less skill to operate this machine.

2. OBJECTIVES

1. To build a machine which produces a tube bend at decided angle in required plane.
2. To design a machine to carry out bending operation automatically using automation.
3. To produce the machine with minimum budget.

3. DESIGN DRAWING OF SEMI-AUTOMATIC TUBE BENDING MACHINE

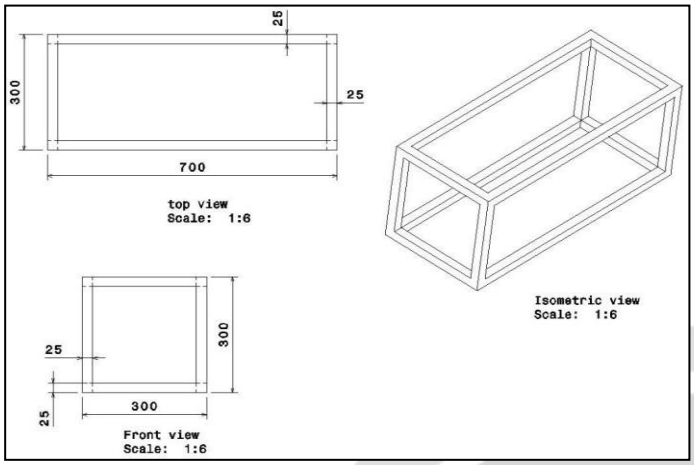

Fig 1: 2D Drawing of Base Frame

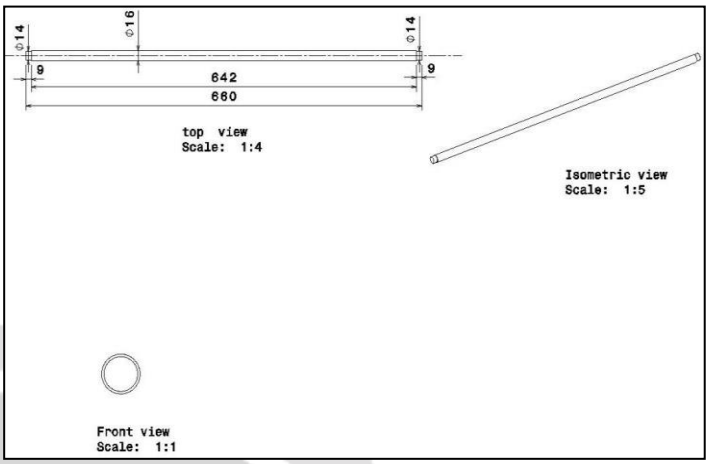

Fig 2: 2D Drawing of Guide Bars

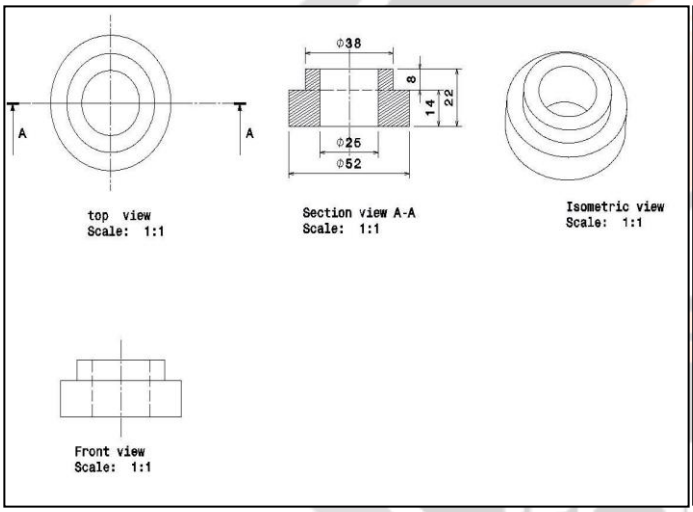

Fig 3: 2D Drawing of Bush

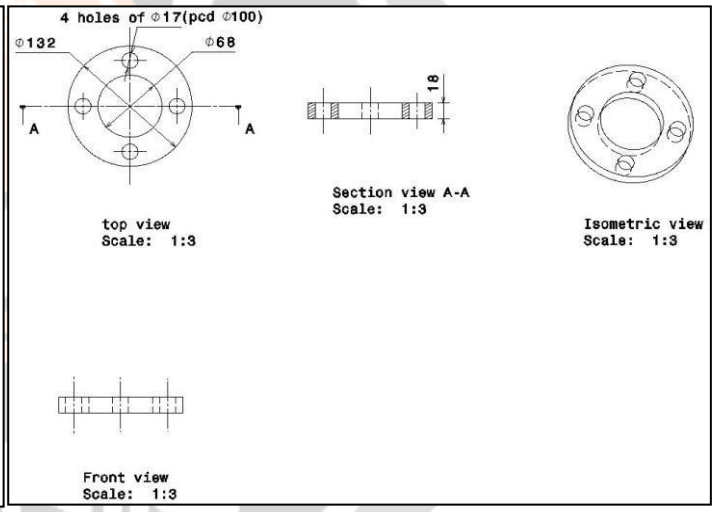

Fig 4: 2D Drawing of Indexing plate

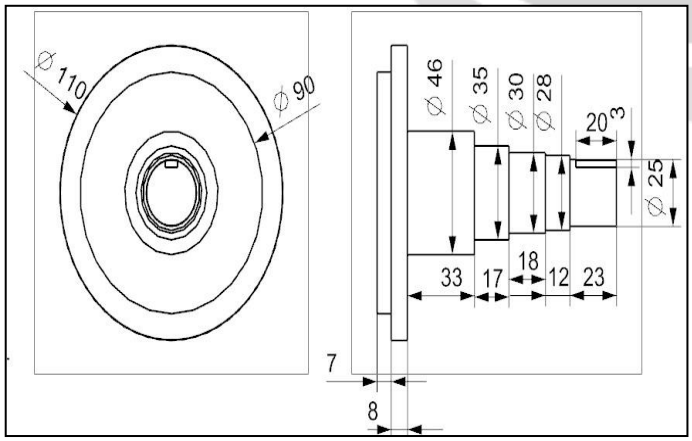

Fig 5: 2D Drawing of Main Shaft

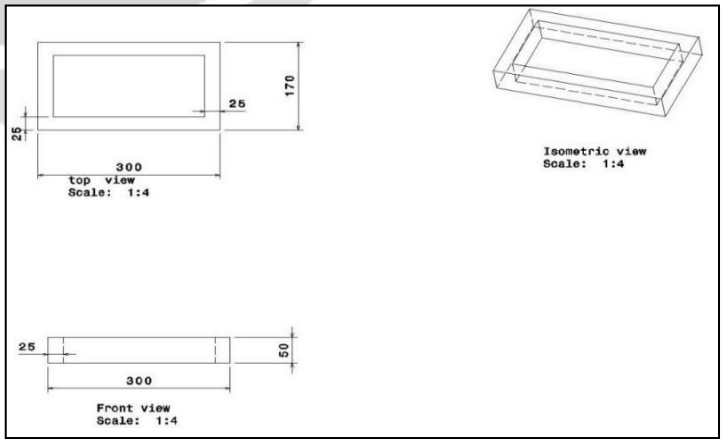

Fig 6: 2D Drawing of Supporting Frame

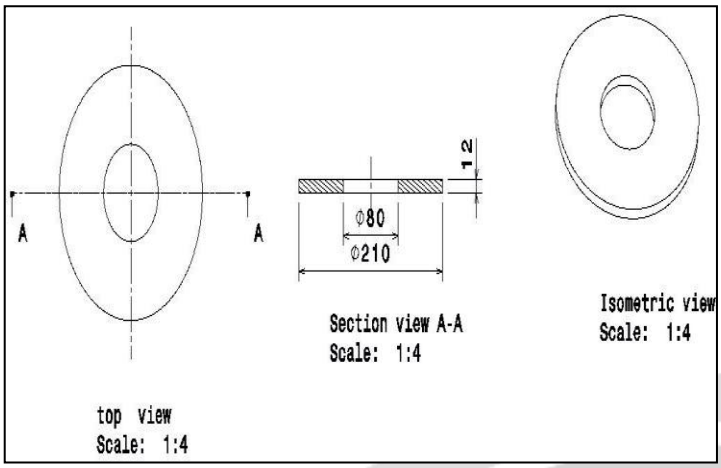

Fig 7: 2D Drawing of Disc

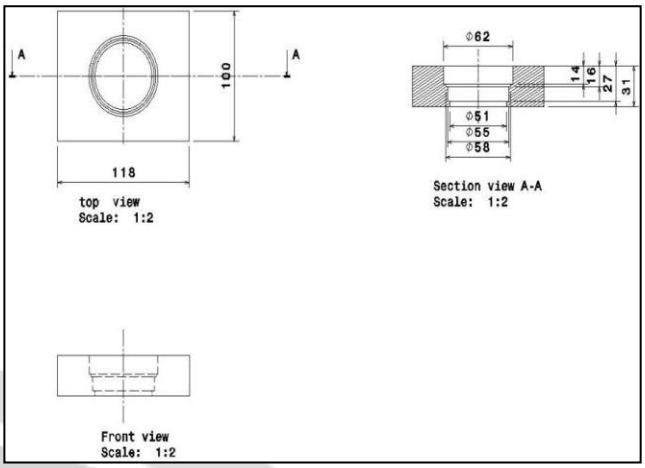

Fig 8: 2D Drawing of Block

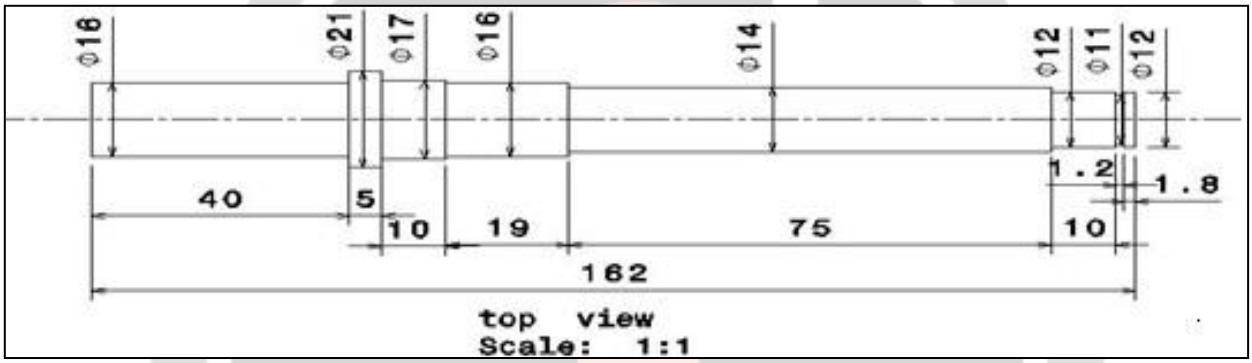

Fig 9: 2D Drawing of Worm Shaft

4. SCOPE

- As future and complementary research several other aspects of bending machine should be examined in order to obtain a complete study with respect to finite- element modeling and manufacturing.
- It would be interesting to model the machine using solid elements for the internal core. A more detailed analysis could be performed to optimize material and price of machine.
- Finite-element and experimental analysis should perform in order to assure the structural integrity.

5. DETAILS OF THE COMPONENTS

1. **Frame:** The frame is a rectangular shaped frame of angles. It is a base of machine. The overall bending system is mounted over this frame, such as chuck mounting, motor mounting, disk mounting, guides, lead screw etc.
2. **Guides**: The guides are fixed between two ends of frame. These are simple round shafts provided to guide and support the chuck during travelling.
3. **Lead screw:** -The power screw is used to travel the chuck during bending process with the help of motor. It is located between two ends of frame.
4. **Die:** -The die is placed on a disk offset from center of disk. It is use to bend the tube by rotating it with the help

of disk. Another die behaves as stopper and also guides the tube during bending.

5. **Disk:** -The disk is a circular shape plate, on which a pulley and die are placed. The disk rotates with the help of gear mechanism provide below it.
6. **Gear Mechanism:** -The gear mechanism is providing below the disk to rotate it with the help of motor.
7. **Motor:** -Motor 1 is used to rotate disk for bending process.

Fig 10: Machine Model

6. WORKING

- Tube bending as a process starts with loading a tube into a chuck and holding it into tube bending die & by checking axial alignment of tube.
- Set tube length at which bend is required and degree of bend.
- Switch on power supply button.
- As the power supply on disk start rotation which is attached with gear mechanism and it connected with motor shaft, with the help of that disk bending die get rotted so process of bending of tube get start as well as chuck assembly moves forward due to pulling force with the help of lead screw.
- The machine having another steady bending die which guides the tube and the bending die rotated tube with the help of sub assembly provide in the machine.
- The machine run according to the settings provide initially and after completing tube bend machine stop automatically.
- The “Semi Automated Tube Bending Machine” obtained the bends by following the above process.

8. MANUFACTURING PROCESSES

1. Measuring and Marking

All the dimensions of the body as well as other components such as shaft, base frame, supportive frame, top frame, body fixtures, motor base and die and ring etc. All the dimensions were decided according to the design. According to the decided dimensions marking was done on the raw material. All the dimensions were finalized and were sent for cutting.

2. Cutting of Body

The measured and marked dimensions of the project were sent for cutting. The right angular body pipe was cut using cutting machine. The thick plate was cut by the cut-off machine. The rectangular hollow sections used for

motor base were cut using cut-off machine.

3. Grinding of Components

The components after cutting as well as some errors in dimensions were reduced by grinding. Grinding machine as well as hand grinder was used for removal of extra material. Some dimensions were inaccurate so they were reduced using grinding machine. After the assembly it was not possible to grind using grinding machine therefore hand grinder was used. It was used to remove the extra welding material as well as reduction of some dimensions of components.

4. Drilling of Holes

Holes were drilled for clamping bearings, clamping of the motor, clamping of the die. Holes was drilled on the body for bearing attachment. Holes were drilled on the base frame for clamping of the motor. Drilling was done by a drilling machine.

5. Welding

It is machine used to join two metals. In following project, the welding used is arc welding. This welding is used to join the body pipes and plate. Welding is a common process for joining metals using a large variety of applications. The metals are heated to their melting point while being shielded from the air, and then a filler metal is added to the heated area to produce a single piece of metal.

8. CONCLUSIONS

The work is a good solution to bridge the gates between institution and industries. The "SEMI AUTOMATIC TUBE BENDING MACHINE", designed for production of various bends at different angle. In this system bending of tube can be extended to its length against workstation is possible. The system can be handled by any operator very easily. Due to low cost and simple design this can be marketed to any of the nation. Wrinkle free tube bends can be obtained. Material properties of tube do not change after bending, since bend is obtained by cold bending operation. The machine can be used for Batch production.

9. REFERENCES

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