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Final Working of Rolling Pipe Bending Machine

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Abstract
This research presents a new mobile bending machine and its practical applications. The proposed machine uses a new method. When pipes are fed between the pulleys they are bent by shifting the relative position. The bending angle is controlled by the length of the fed pipe. This forming process has a big advantage. A change of the expected bending shape will need no change in the tooling system.

Keywords: *– Pulley, motor, gears, sprocket, big screw, shaft, C-panel*

I. INTRODUCTION

During the roll bending process the pipe, extrusion, or solid is passed through a series of rollers (typically 3) that apply pressure to the pipe gradually changing the bend radius in the pipe. The pyramid style roll benders have one moving roll, usually the top roll. Double pinch type roll benders have one adjustable rolls, usually the top rolls, and a fixed bottom roll. This method of bending causes very little deformation in the cross section of the pipe. This process is suited to producing coils of pipe as well as long gentle bends like those used in truss systems. Therefore, our objective is to increase accuracy at low prize without affecting the pipe bending productivity. As one kind of key components with enormous quantities and diversities, the bent tube parts satisfy the increasing needs for lightweight and high-strength product from both materials and structure aspects. The bent tubes have been widely used in many high-end industries such as aviation, aerospace, shipbuilding, automobile, energy and health care. The tube bending has become one of the key manufacturing technologies for lightweight product forming. Via the analysis of bending characteristics and multiple defects, advances on exploring the common issues in tube bending are summarized regarding wrinkling instability at the intrados, wall thinning (cracking) at the extrados, spring back phenomenon, cross-section deformation, forming limit and process/tooling design/optimization. Some currently developed bending techniques are reviewed in terms of their advantages and limitations. Finally, in view of the urgent requirements of high-performance complex bent tube components with difficult-to deform and lightweight materials in aviation and aerospace fields, the development trends and corresponding challenges are presented for realizing the precise and high-efficiency tube bending deformation[1]. This research presents a new flexible bending machine and its practical applications. The proposed machine uses a new method. When tubes are fed into the fixed and mobile dies, they are bent by shifting the relative position of the mobile die. The bending radius is controlled by the relative distance and orientation between the mobile die and the tube.The bending angle is controlled by the length of the fed tube. This forming process has a big advantage. A change of the expected bending shape will need no change in the tooling system but only a new definition of the motion of the active die and the length of the fed tube. The active die movements are controlled by a 6-DOF parallel kinematics mechanism (PKM) with hydraulic servo drive. Making use of the PKM serves not only to achieve a complete motion along six axes but also to obtain a high dynamic motion of the bending machine. Application examples show that the bending machine can be applied to designer's interiors, universal designed products, and automotive parts. Until now these processes have been difficult to achieve using a conventional bending machine [2].A bicycle integrated pipe bending mechanism has been designed and developed. The machine consists of a chain drive, compound gear train that is utilized for bending steel pipe of outside diameter 25mm and having 2mm thickness. The kinematic synthesis of bending mechanism is carried out. The dimensional analysis is done. Relation deduced predicts the performance of bicycle integrated pipe bending mechanism and all the parameter needs to be optimized to get the best performance of the machine. Bent pipes finds its application in frames for furniture, handle of bicycle, barricade etc. or as passage for carrying fluids or gases like hydraulic lines, fuel lines, exhaust pipes, water lines, etc. Industries using bent pipes are boiler, air conditioning, ship building, furniture, power generation, recreational vehicle, railroad, automotive, off-road and farm equipment, aircraft etc.[3]

1.1 Bending data can be defined as:

(a) Degree of bend sometimes called angle.
(b) Distance between bends sometimes called length, feed and position.
(c) Plane of bend sometimes called twist, rotation and orientation.

II. Detail Description

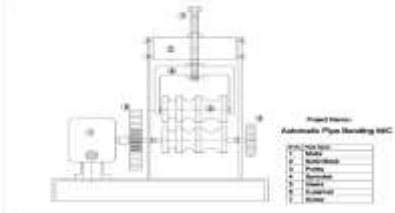

Figure 1. The detail assembly of pipe bending machine

The Figure.1 itself signifies the labeling of various object used to make a component. List of the object labeled are:

- *Motor*
- *Solid block*
- *Pulley*
- *Sprocket*
- *Gears*
- *C-Panel*
- *Screw*

This are object are properly assembly so that finished part can be obtained and no wrinkle and wear. Accuracy and its material reliability makes the component highly precision.

III. Working of pipe bending machine are as follow:

3.1 Step: 1

This Figure.2 represents, the current supply from the AC main supply, motor rotate small gear which connect with motor shaft. The small gear connects with big gear which runs the pulley.

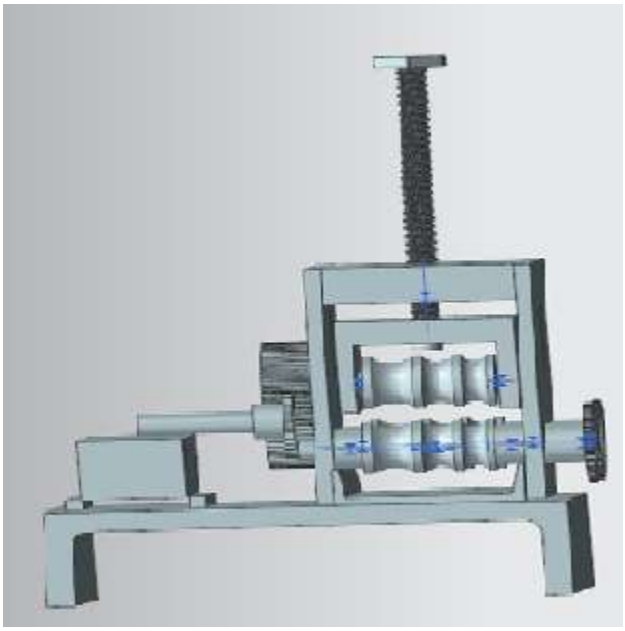

Figure.2 machine in idle condition

3.2 Step: 2

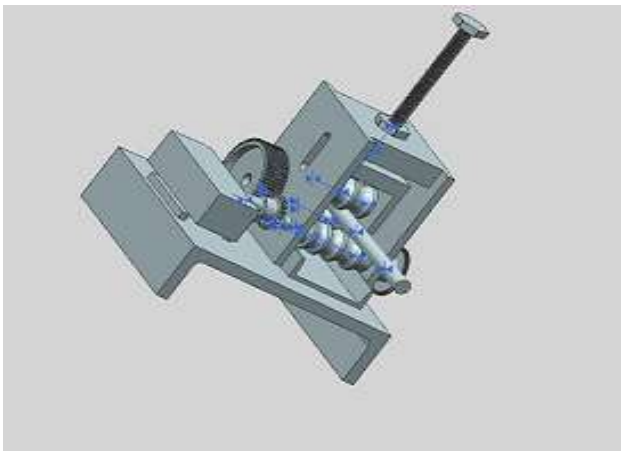

Figure 3.2 Inserting of M.S. steel pipe

This figure3. Represents the simply inserting the pipe filled with sand (wet) between pulleys. Afterwards applying load on upper pulley which is connected with C-panel the help of screw.

3.3 Step: 3

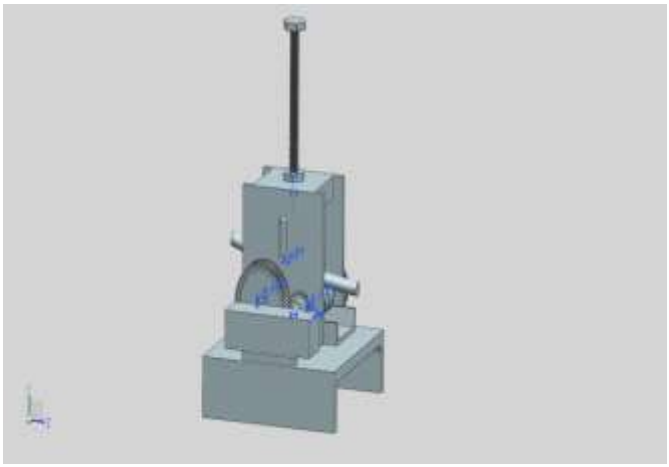

Figure 3.3 Appling load on pulley

As much we applying load on pipe so, pipe will start bending without wrinkling. Due to using sprocket it distribute equal load on both lower pulleys.

3.4 Step: 4

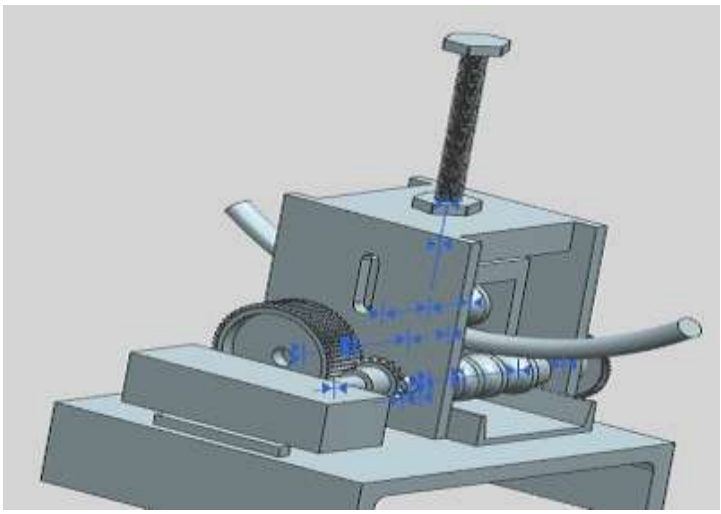

Fig 3.4 Applying more load

As we applying more load on upper pulley with the help of big screw, so pipe will bend more than previous step. While using forward reward switch pipe will bend at particular distance. So the bending process takes approximately 3 to 4 minute.

IV. CONCLUSION

The Current machine design has the following features:-

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 piped. Instead of complicated designs the simple kinematic system is used. In this system bending of pipes can 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.

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