Manually Operated Pipe Bending Machine

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Abstract- *In our project Pipe Bending Machine various diameters of pipe is being bend with the help of this machine and various shapes is obtained like V-shape, circular, square, channel etc.Roller bending a current developing process is an available service in the present market; however, each roller bender has a different mechanism with its pros and cons.It is widely used in various industrial operation such as bending a tube to make coil or sheet metal to make certain shape such as 'V' shape.The following report will include a description of the usability of this machine. The critical parameters that should be accounted for in the pipe bending are bend radius and angle, pipe diameter, and thickness.*

Keywords- Supporting frame, Pulleys, Nut and bolt , Crank, Supporting arm, Square pipe

I. INTRODUCTION

Bending is a manufacturing process that produces a V-shape, U-shape, or channel shape along a straight axis in ductile materials, most commonly sheet metal. Commonly used equipment pulleys and pan brakes, brake presses, and bearings other specialized machine presses.A Pipe Bending Machine is a type of Machine that is constructed to roll and bent the hallow pipes and even the sections (the sections are the thick and long metals that have square or rectangular shapes) too.

It is also called Manual Pipe Bending Machine or Section Bending Machine whereas; the sections also can be used to bent.

The type of material that can be used to bend on the manual pipe bending machine is Stainless Steel and Cast-iron. Usually, the rolled or bent pipes are used for handlers, pressure operators; they are also used in many engineering services.

A bending is a process of bending a metal.

The metal can be a sheet metal, tubes, square hollow, rod, and iron angle. This type of metal has its own thickness. In bending machine designing several considerations is taken into including type of metal, type of the roller bender, power driven or manual and the size of the bending machine.

II. HISTORY

For centuries, humans are trying to find a way to enhance their life routine. Now, after reaching the 21" century, discoveries are still being presented.

Before Jerry Huth developed the first automotive pipe bender in the 1950s, fitting exhaust pipes was a difficult job that was beyond the means of many shops.
Mechanics had to cut and weld pipe sections, making small bends manually.

By 1958, Huth had developed the first prototype of the portable pipe bender. Soon, Huth was supplying benders to shops across the country.

Huth Benders continue to lead the field more than 50 years later due to ongoing research and development,

The onset of the industrial revolution took place from the 17th century until the mid-18", this revolution was the reason for the existence of functioning machines today.

The main branch of this revolution is manufacturing since it allowed the use of machines that significantly made human daily tasks much easier.

•The 1980s

With the gradual opening up of China, advanced manufacturing methods from abroad began to be introduced into China, and hydraulic technology was applied to pipe bending machines. This also enabled the bender to solve the problem of high noise and low efficiency.

•Mid-20th century

Bender into the Chinese market in the 1950s, due to the needs of society at the time, China began to produce benders in the country, but the bender is relying on cams or a

large gear amplitude drive to drive the slider to die, this machine has low efficiency, high noise, and the bending force generated by a large limit. But the concept of this bender also provided the pavement for the development of later bending machines.

•After the 21st century

With the development of intelligent technology, fully automatic pipe bending machines began to appear. The bender series uses a VDU touch screen operating panel, under the precise control of the industrial control machine, the three-movement coordinates Y, B, C can achieve a fully automatic mandrel.

III. CONSTRUCTION & WORKING

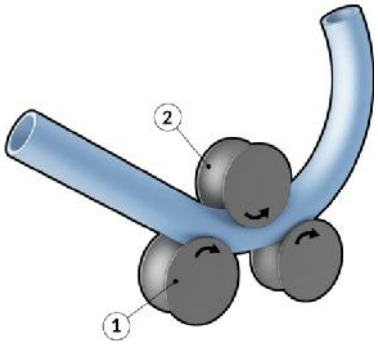
CONSTRUCTION:

Components of pipe bending machine:

1) Supporting frame-The body is the structure of the machine where whole parts and components will be fixed. The components to the body will be fixed using a nut and bolt or welding process.
2) Pulleys-The pulleys can be called the dyers or molders where the component that needs to be bent is kept between these rollers so due to the performing of bending operation, the rollers can be called dyers or molders.
3) Nut and bolt- Nut bolt assembly fitted in pulley and frame which fasten multiple parts together. The two partners are kept together by a combination of their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together.
4) Crank handle-crank handle mounted on the upper pulley of bolt which helps to rotate the upper level of pulley which do bend the pipe
5) Supporting arm- Supporting arm welded on the both side of frame which helps to stand the upper pulley pipe in vertically

6) Square pipe.

WORKING



The rollers (or dies) play an important role in bending the pipes or sections. Firstly, the appropriate rollers or dies are chosen according to the type of section that to be bending then it is fixed to the shaft. Here three rollers (one with a high diameter and another two with similar and small diameters) are used.

The large diameter is fixed on the top and exactly between the small rollers and a gap is maintained between the large and small rollers for introducing the material that needs to be bend. Now the gap between the large and small rollers is adjusted according to the diameter and size of the metal. After placing the material between the rollers, the gap between the rollers is decreased and pressure is applied. The operating wheel is slowly rotated; as the rollers and operating wheel are interconnected, the rollers will rotate with respect to the operating wheel.

The rotation of the wheel and the pressure that is applied will result in the bending of the pipe or section. The different sections are bend using different types of rollers. The large diameter is fixed on the top and exactly between the small rollers and a gap is maintained between the large and small rollers for introducing the material that needs to be bend.

PULLEY:

- Pulley is a simple metallic or wooden machine which uses a wheel and a rope for lifting heavy loads.
- Nowadays, for carrying small loads, plastic pulleys are also being used and available in the market.
- We can rotate it very freely just by the axis passing through its center.
- It helps in changing the direction of the force which helps in making it easier for the people to lift any object with the help of a pulley.

- One can pull down one end of the rope to lift ten Kgs objects which are one meter high.

Nut:.

A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together.

Nuts

The two partners are kept together by a combination of their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together.

Bolt:

Bolt, mechanical fastener that is usually used with a nut for connecting two or more parts. A bolted joint can be readily disassembled and reassembled; for this reason bolts or screw fasteners are used to a greater extent than any other type of mechanical fastener and have played an important part in the development of mass-produced articles and steel structures.

IV. DESIGN CONSTRAINTS AND DESIGN METHODOLOGY

Geometrical Constraints:

Since our project aims to make a curve and bend martial, it also aims to make the design helpful in every aspect of the industry. Also, the idea is to develop and design a small roller bending machine that will help improve the use of roller bending in the industry at a lower cost and make sure that our prototype is portable and can be easily used everywhere.

Sustainability:

Sustainability is concerned for the prototype. It was made sure that selection of components, like bending rollers and chain drive and Spindle wheel and Sprocket Brass and supporting frame, was made according to choose the proper material. Also, our concerns are that there is a limitation for our prototype like the capability for see bending material sheet because it should be suitable an can sustain for 4mm thickness and less, and it should be below 145 torque.

Also, another concern is corrosion that can affect the prototype because it can be exposed to erosion, so we must consider controlling the corrosion by using barrier coatings like paint.

Environmental Concern:

Our prototype is friendly to the environment because it does not require a gas motor that will not release emissions. So, it will not affect and harm the environment because the bending machine is a manual roller. So, there are workshops that is use an engine roller machine bending instead of manual, and that harm the environment. however, using this prototype in theindustry very helpful for the environment.

Economic:

On the economic side, it helps to save energy because it does not require any energy cost.So that will help the users not thinking about energy consumption. Also, it is effort able for everyone according to the price for the roller bending machine.

V. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

ADVANTAGES

1) The effort that required bending the pipe or section will be less.
2) The main advantage is that it is simple in construction.
3) It is easy to operate the manual bending machine.
4) No need for any hydraulics and coolants for its operation.
5) The unique advantage of pipe bending machine is that it does not require any electrical power and it purely works on mechanical effort.
6) Reliably produce small and large components in multiple shifts.
7) The ability to work at greater speeds, using less manual labour, using standard industrial parts, and saving on material costs.

DISADVANTAGES

1) There is no easy way to incorporate changes to the tube geometry once the bending unit is built.
2) A disadvantage of air bending is that, because the sheet does not stay in full contact with the dies, it is not as precise as some other methods, and stroke depth must be kept very accurate.

APPLICATIONS:

a. The applications of pipe bending machine is mostly observed in engineering workshops.
b. The manual bending machine is used for bending the construction components.
c. It is used in railway applications, bridges, boilers constructions, and ship constructions.
d. It can be used for decorative components also.
e. Industrial – Industrial use means used in manufacturing, mining or chemical process or in the operation of factories, processing plants and similar sites.
f. Automotive – Automotive engineers work as part of a team to design, develop, manufacture and test vehicles.
g. Agricultural – Agriculture is the art or science of cultivating soil, growing crops and raising animals.
h. Commercial Vehicles – Commercial vehicles are a type of motor vehicles used for loading goods or playing passengers.

VI. CONCLUSION

Pipe bending is regular phenomena now-a-days. In mass production various automatic and semi-automatic bending mechanisms are used. But for small production automatic and semi-automatic pipe bending machine are costly.

Also, where electricity is rare and costly they cannot be used. On the other hand, manual pipe bending is less expensive and can easily be made and operated. In this report the designs, construction and performance test are illustrated. From the Performance test the result can be summarized as:

1) For two fixed rollers the bending diameter depends Only on the deflection of the mid roller.
2) For the higher deflection the deviation in results is Reduced.

The bending of the metals like stainless steel and cast iron with a high thickness is hard and cannot be bend using human efforts so, a simple construction is required that can perform the required operations. The bending machine (or section bending machine) will do the absolute operation that we require to do. It will bend the pipes, sections that are high in thickness.

The hallow sections like rectangular, square, and circular components are drawn without any damages. It should be kept in mind while bending the material that the angle and length that need to be bend is calculated and then processed in the machine. The manual bending machine requires more effort than the hydraulic pipe bending machine or automatic bending machine.

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