

Metal Sheet Bending and Pipe Bending Machine

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Abstract- On a sizable industrial metal sheet bending machine, this idea is based. By working on this project, you can help to mitigate the societal problem as much as you can. We intend to implement the concept in a real-world scenario and will be discussing it in full along with the associated costs. Mechanical engineering is useless if production and manufacturing are not taking place. Utilizing modern technology effectively allows for the conversion of raw materials into finished products that meet the required specifications and dimensions. Our machine can bend pipes of various diameters and can also shape metal sheets into a variety of shapes in our project "sheet metal and pipe Bending Machine." The equipment is perfect for mobile work due to its size and it is fully constructed of MS steel. It is also convenient and portable for use at any time. Compared to other machines, this one take less technical expertise and manual labour to operate. It can only be used as a hand-operated, hydraulic, gear, and block bending machine, we've made sure of that. (frame). Without using power, the machinery manually bends metal sheets and pipes. Our objective is to provide precision at a low cost while retaining pipe bending productivity. This machine is powered by an easy-to-understand kinematic system. Due to its mobility, it is widely utilised by workshop or fabrication searchers in small shops. A bending machine is a typical tool in a workshop that commonly bends metal.

Keywords- bending machine, fabrication, sheet metal bending machine, pipe bending machine

INTRODUCTION

Sheet metal bending is a manufacturing operation that yields a V-shape, U-shape, or channel form along a straight axis. Box and pan brakes, brake presses, and other specialised machine presses are frequently used pieces of machinery. Metals such as sheet metal, tubes, square hollows, rods, and iron angles are all acceptable. This particular metal has a unique thickness. Several factors are taken into account when designing a bending machine, including the type of metal, the roller bender's power source or manual operation, and the machine's size.

The only thing that distinguishes these various types of bending machines is often their capacity to accommodate sheet metal and tube bending equipment. Numerous machine manufactures alter their goods based on the bending machine's capacity and whether it is powered or operated manually until the desired form is achieved.

NEED FOR METAL SHEET AND PIPE BENDING MACHINE

As pipe bends are utilized in many home items, it is essential to construct a cost-effective pipe-bending machine. Various metal sheet bending and metal pipe bending machine designs without these bending devices, a machine cannot function properly. It is utilized for pipe purposes in industrial applications because there isn't a suitable bending machine to bend a solid or hollow pipe on a small scale, a bending machine has to be designed. There are many different types of bending machines available on the market. There are bending devices including a press brake, a roll bending device, and a folding device.

TYPES OF BENDING MACHINE

HYDRAULIC BENDING MACHINE

An automated instrument for forming and shaping metal pieces is a hydraulic bending machine. A workstation, support, clamping plate, and pressure plate are all part of it. A foot pedal can be used to manually or automatically control the clamping action. The machine's base has a moving coil tucked away in a recess. A wire that is connected to a hydraulic cylinder energises the coil. As a result, the coil becomes energized and produces a force that acts on the bending plate.

AUTOMATED CNC BENDING MACHINE

A cutting-edge manufacturing method that can produce parts with precision is an automated CNC bending machine. It combines flexibility with specialised equipment like mandrels, compression

tooling, and a workstation. The device has a coil feed, a hopper, and a bending modulus. The device can also be fitted with transfer units and robots. Metal pieces are manufactured using CNC bending machines. Three rollers total, one fixed and two movables, are included in these devices. The workpiece will be moved to the desired location and bent into the shape you want by the rotating part manipulator. Additionally, these CNC bending machines are capable of producing coils and cones with ends.

PRESS BENDING

Press bending, which involves pressing the workpiece vertically to create a V or U-shaped workpiece, is one of the oldest methods of bending. Because the workpiece would spring back to its previous shape if the deformation remained in the elastic region, the workpiece will continue to be pressed until it enters the area of plasticity. Speed and accuracy are two benefits of press bending, and each die has its own angle, allowing for a range of workpiece bending.

TUBE BENDING

For any significant bends wherein the centre of the radii is at least four times the tubes outside diameter, the Forming Rolling approach to tube bending is advised. The most practical way to bend tubes with very small diameters, it can also be used to bend pipe or thick wall tubes to shorter radii. Even a small bit of tube slippage during the bent operation will result in distortion, hence the Forming Rollers and the radius Collars must be grooves to precisely match the tube.

CIRCLE BENDING

This bending is to the class of most materials "spring back" after being created, this procedure is quite complicated. It can be essential to employ a radius collar with a diameter that's smaller than the appropriate circle to make up for this. Because the "spring back" differs in various materials, experimentation is the best way to establish the exact size. Before shaping, the material should be precisely pre-cut to length.

CHANNEL BENDING

The very same general bending guidelines that apply to the formation of the channel with "flanges out" also apply to the formation of the channel with "flanges in." The technique described below requires

significantly greater bending pressure while forming with the "flanges out" since the flanges must be compressed when they are bent inward. It is advised that the biggest radius be used to accommodate for the material's compression. If a razor-sharp 90° bend is desired, the channel flanges can be given a notch before being formed around a unique Zero. In some cases, a portion of the radius Collar or a similar device can be used to draw a circle in a channel. The circle can be created in three steps by using the method described. As a radius collar is unable to support each flange in this position, it is required to first fill the channel with Cerro bend or another commercial filler before forming it using the flanges facing upward.

SQUARE BENDING:

The same idea behind bending is utilized to create a minimum radius bend across rectangular, square, or other multisided blocks. Material is "led" between the block's corners by the forming nose. By using this method, zero radius bends of any number can be produced in a single operation in any kind of solid material. The same process outlined above can also be used to produce a square eye that is both centred and off-centre. The square block's size and the material's ductility are the limits of this method of bending. In general, squares greater than one should be built utilizing the smallest radius blocks by progressive processes.

LITERATURE SURVEY

1. Research and Production Design and Development of Universal Metal Bender-The standard machines now on the market are large, stationary, and immobile. They take up a lot of room, which is the most crucial thing to take into account when creating a shop's layout. As a result of their high cost, small-scale manufacturers cannot afford to buy them. The cost of upkeep and repairs is significant because the majority of components are pricey, and damage to one element impairs the operation and causes production to halt. There isn't a combined machine for pipe and sheet metal bending.
2. Review on Design and Analysis of Portable Rolling and Bending Machine -In this study, the variation in roll distribution of pressure is linear. This approach made it simple to determine rolling variables such rolling force,

torque, and developed curvature. You can apply a bending moment in the appropriate direction. Additionally, using a bending moment at the roll gap's entrance in a symmetrical rolling process results in a difference in pressure on the rollers and warped at the outlet, just like in an asymmetric rolling process. A transportable bending machine is a tool that requires less human effort from workers while still performing construction and other metal-working tasks as needed.

3. Research and exploration of sheet material bending machine -The paper investigates the mechanism and fundamentals of the design of a sheet material bending machine, focusing on the design of the overall structure, the rear stopper, and the transmission part. The mechanical structure of the bending machine is then calculated and checked, such as workbench magnitude and connecting bolt inspection. One of the most common metal sheet machines is the sheet material bending machine, which uses a straightforward universal mold to bend sheet metal into different parts at various angles when it is cold. The demand for bending precision, productivity, and automatic operation increased steadily along with the use of bending machines in a variety of sectors.

WORKING PRINCIPLE

A piece of equipment called a hydraulic jack is used to lift huge objects with significantly less force. It is based on Pascal's law, which asserts that a mass of fluid at rest transmits pressure intensity equally in all directions. Now Consider a ram and plunger that moves through a chamber that contains some liquid and is joined at the bottom by two cylinders of varying diameters. A tube is loaded onto the pipe bender and clamped between the two dies, the securing blocker and the forming die, to begin the process of pipe bending. Two other dies, the one for the wiper dies and a pressure die, are similarly only weakly holding the tube. This project's basic idea is to concentrate upon the hydraulic cylinders and piston forces caused by fluid pressure. By applying the Pascal principle, which states that in a closed system, the oil pressure is the same in all directions, the pressure on the piston head and the cylinder's base plate are identical because the areas of the two are equal. As is common knowledge, force is the result of the pressure and area under pressure, along

with the direction of the force created on the piston's head is directed forward, the pressure developed on the cylinder's base plate is directed backward. The opposite side lever is subject to pressure from the piston, and the other side lever is under pressure from the cylinder. the pipe is fitted to the pulley and the jack's hydraulic pulley. Whenever the handle is moved, a hydraulic jack applies the bending force. The pipe is bent as a result. The pulleys are modified or changed to get the desired diameter of the bending curve. A tube is loaded into the pipe bender and clamped within two dies, the securing blocks and forming die, to begin the process of pipe bending. Two of the other dies, the one for the wiper dies and a pressure die, are similarly only weakly holding the tube.

CONCLUSION

The numerous pipe bending machines comprised of various dies utilized in manufacturing across industries are known from this project, and they effectively bend a metal sheet, a metal pipe, and a metal rod. Due to its extremely cheap cost of operation and high efficiency, the bending tool is especially helpful in domestic applications. This paper explains several pipe shapes, including square, V-shape, channel bend, and circular shapes. Pipe bending is a frequent occurrence today. In mass production, numerous automated and partially automated bending systems are used. However, automatic and partially automatic pipe bending equipment is pricey for large-scale workshops and restricted manufacturing. They are still unable to be used in places with expensive and infrequent electricity as well as in modest workshops. Our metal pipe and sheet bending apparatus, on however, is less expensive to create and operate. This report includes images of the plans, development, and tests. Here is a summary of the outcomes

- 1) Bend a sheet of metal with an angler.
- 2) using special dies and bent metal pipe
- 3) using special dies, bent metal rods

Finally, we may talk about the machine's economics. Steel, the material utilised in the machine, is totally recyclable, thus its environmental impact is minimal.

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