"FABRICATION OF AUTOMATIC CONTROLLED SHEET METAL CUTTING AND WELDING "

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Abstract: In the contemporary manufacturing landscape, the demand for multipurpose machine and is used for multiple operations in the field of mechanical engineering   . The Scope of the project involves on the development and implementation of an automated system for sheet metal cutting and welding. There are sheet metal operations which also involves joining as a subsequent process. The system integrates automation & robotic technology to automate the traditionally labor-intensive processes of cutting and welding metal sheets

INTRODUCTION

The modern manufacturing industry is constantly evolving, demanding higher levels of efficiency, precision, and automation to meet the growing demands of various sectors such as automotive, aerospace, and construction. Sheet metal processing is a fundamental component of many manufacturing processes, and the need for cost-effective, high-precision solutions has never been greater. To address these challenges, the development of an Automatic Controlled Sheet Metal Cutting and Welding Machine is a crucial endeavor.

In order to cater the varying and challenging needs of micro and small scale industries. There is a need to develop fully automated which can increase and integrate the quality control. The integration of cutting and welding processes into a single machine offers a streamlined solution to fabricate intricate metal components with unmatched precision. The project sets out to create a prototype that showcases the potential of such a machine, emphasizing its adaptability to various sheet metal types, thicknesses, and shapes.

In addition to addressing the need for automation, the project places a strong emphasis on safety. The manufacturing environment can be hazardous, and this machine will incorporate advanced safety features to protect operators and prevent accidents during its operation. The design will also prioritize cost-effectiveness, ensuring that the machine offers a compelling return on investment for manufacturers looking to adopt this technology.

SYSTEM ARCHITECTURE

The process begins with loading the sheet metal material onto the machine's feeding system. This can be done manually or with the help of a material handling system such as a conveyor belt or robotic arm.

The cutting process starts with the sheet metal being positioned accurately within the cutting area of the machine. Various cutting technologies can be used, including laser cutting, plasma cutting, waterjet cutting, or mechanical cutting depending on the material thickness, type, and precision required. The cutting parameters such as cutting speed, power, and nozzle distance are controlled by the machine's software based on the design specifications. After the sheet metal is cut to the desired shape, the welding process preparation begins. This may involve cleaning the cut edges, applying clamping or fixturing to hold the pieces in position, and prepping the surfaces for welding (e.g., removing oxides or contaminants).
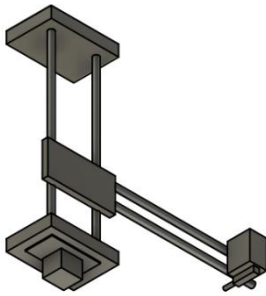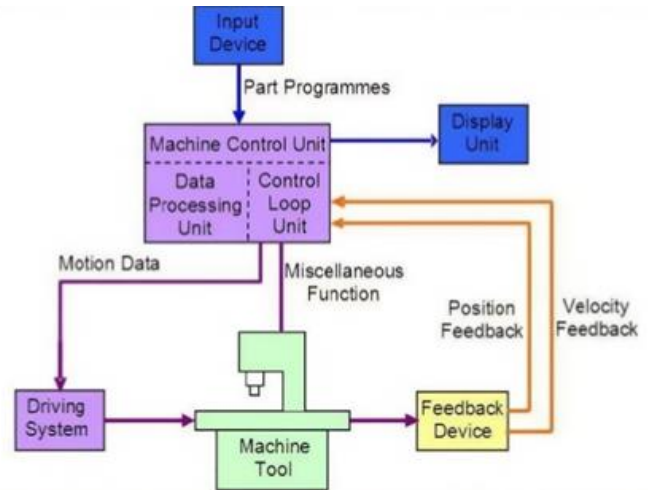
FIG 2: 3-d Model

Fig 1: Block Diagram

COMPONENTS

ARDUINO UNO R3 :

Arduino is an open-source electronics platform that has revolutionized the world of prototyping and DIY electronics. Developed in the early 2000s, Arduino provides a flexible and user-friendly environment for both beginners and experienced makers to create interactive projects. It consists of a microcontroller board and a software development environment, enabling users to easily write and upload code to control a wide range of electronic components.

DC MOTOR

A DC motor is an electrical motor that uses direct current (DC) to produce mechanical force. The most common types rely on magnetic forces produced by currents in the coils. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor

CNC SHIELD CONTROLLER

This smaller CNC Shield v4.0 Board can control 3 stepper motors. It comes with 3 x A4988 stepper drivers, heat sinks and an Arduino Nano compatible.
The CNC Shield v4.0 is controlled by an Arduino Nano running GRBL. This makes it easy to use via.

LINIER MOTION ROD

Linear shafts are a special type of mechanical shaft that carry out linear motion in one direction. These shafts usually work with a series of components that move along the length of the shaft. The movements can be either slow or fast, depending on the shaft type used. Linear shafts are becoming increasingly popular in drive technology. They offer a high degree of precision in motion. Linear shafts offer several advantages compared to conventional shafts, including high rigidity, high positioning accuracy, longer service life, and outstanding control performance.

CONCLUSION

The sheet metal cutting and welding prototype was modelled using a 3D modelling software and successfully fabricated.
The process was automated using auridino, stepper motor and motor drives with the use of CNC shield.
Sample components were successfully produced using the developed prototype machine .
Products components produced using sheet metal cutting process was able to achieve tolerance and butt welding with good strength

REFERENCES

[1]. J. Om Prasaad , Krishnan A.B.Fabrication and Review of Hydraulic Heavy Sheet Metal Cutting machine, Journal of Emerging Technologies and Innovative Research , Volume 3, Issue 4, April 2016,pp 37-41.

[2]. Satyam Kumar Dubey, Mahesh, Design and fabrication of pneumatic bar bending machine, International Research Journal of Engineering and Technology, Volume: 04 Issue: 03 | Mar -2017,pp 1403-1406.

[3]. P.M.Pradhan, Aryan Pratihar Design and Fabrication of Pneumatic Sheet Metal Cutting and Pneumatic Sheet Metal Bending Machine, International Research Journal of Engineering and Technology, Volume: 04 Issue: 03 | Mar - 2017.pp 2339-2342.

[4]. k.krantikumar,Ayog ,Kumar Rastog International Journal of Engineering Research And Advanced Technology, Special Volume. 02 Issue.01, May-2016, pp 564-572.

[5]. Suraj V Bhosale,Adarsh Raunak Design and fabrication of hydraulic bending machine, International Journal of Advanced Research in Science & Engineering, Volume 07, April 2018, pp 458-463.

[6]. Mayank Sehdev, Shubhankar Vikram SinghAutomatic welding machine for pipeline using MIG welding process. Int. Res. J. Eng. Tech. 3(12), 1448–1454 (2016)

[7]. Nawal Kishore, Vikas Kumar SinglaA review on defect minimization in MIG welding. Int. J. Res. Appl. Sci. Eng. Tech. 8(9), 93–96 (2020)

[8]. Arun S, Sree Rajendra, Vijayavithal Bongale, "Automatic

[9]. Punching Machine: A Low Cost Approach", International Journal of Advanced Mechanical Engineering ISSN 2250-3234 Volume 4, Number 5 (2014), pp. 509-517