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AUTOMATION OF CIRCULAR WELDING

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Abstract: Development of a portable rotary MIG arc welding machine, the rotary MIG ARC welding is one of the several techniques developed for narrow gap welding. It has been found that fusion characteristics of the HAZ is improved because of the nature of the ARC physics. The process can be effectively used for different materials particularly those sensitive to heat input including high strength low alloy, stainless steel and heat resistant steels, aluminum and titanium alloys. Based on this result, it has been identified that this type of welding is more suitable for fillet and butt welding. The principle of the process is that the welding wire is fed into the electrode nozzle with eccentricity at the contact tip.

In this project we will be doing Design, Analysis & Manufacturing for automation for circular parts welding with uniform weld structure. We will be designing & manufacturing the turntable which will be rotating at specific required speed depending upon the requirement of fillet material to be added. Further the electrode nozzle is kept stationary, which will be in contact with the surface of the component to be welded. Hence in this project, a detailed design for converting the conventional MIG welding (ARC) machine into an automated circular component welding machine has been proposed. Along with this main modification the existing MIG welding machine – (a stationary downward ARG – HEAD which has provisions for horizontal and upward movements) is to be modified into a portable welding machine.

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I INTRODUCTION

Nowadays mass production is often required to automate the manufacturing processes that were conventionally done manually. In presence various welding technique is used for the welding processes such as CO2 welding or Electric arc welding, TIG (tungsten inert gas welding), in that various fixture is use for various welding, but in many application we use some technique which is not work efficiently & accurately. Moving the electrode along the welding line is a skill full work and especially for circular component become much more difficult. To avoid such a problem we implement a welding rotator .The need of a special device which can rotate the job at a fixed rate to assist the welding process for circular components and ensure good profile and homogeneous welding. Many different energy sources can be used for welding, including a gas flame, an electric arc, a laser, an electron beam, friction, and ultrasound. While often an industrial process, welding can be done in many different environments, including open air, underwater and in outer space. Regardless of location, welding remains dangerous, and precautions are taken to avoid burns, electric shock, eye damage, poisonous fumes, and overexposure to ultraviolet light.

Problem Statement

In CO2 welding or sometimes electric arc welding the need often arises for welding of circular shape components, where the welding is carried out on the entire periphery or a partial arc length of the job. The electrode is thus moved along this circular path in the conventional method. But movement of the electrode is much more difficult and it is much easier to index the job.

For welding the current workpiece Cycle time is higher i.e 45-60 sec. So we need to develop such a system for easy workpiece loading and & auto welding gun positioning. Auto ON/OFF the switches of the welding machine to achieve the smooth working.

Objectives of Project

1. Develop system using AutoCAD 2014 & CATIA V5R20
2. Check frame safety using analytical methods (Student Version ANSYS 15.0)
3. Implementation of concepts to increase the productivity of welding.

Need For Project

Robotic welding systems offer three main advantages: consistent weld quality, increased output, and decreased variable labour costs.

Consistent weld quality The welding task associated with the magnet coils is extremely labour intensive. With most labour intensive tasks, quality tends to decrease the longer the activity is continued. Unlike a manual welder, a robotic system is not subject to fatigue and is able to sustain high quality welding for prolonged periods of time. Well-designed robotic systems have the capability to repeat any taught action with the same quality results. This attribute is important since there are several different magnet configurations and each configuration is used multiple times.

Increased output Industrial experience suggests that the average robot can weld at least twice as fast as a skilled manual welder. The increased speed helps avoid potential delay due to the welding operation, and a quicker turnover of magnet coils can be realized

Decreased variable labour costs Due to the increased output, overall labour time is shortened and labour costs are reduced. The limited availability of skilled, certified welders may pose a challenge. Conversely, general machine operators are more readily available and more affordable than skilled, certified labour.

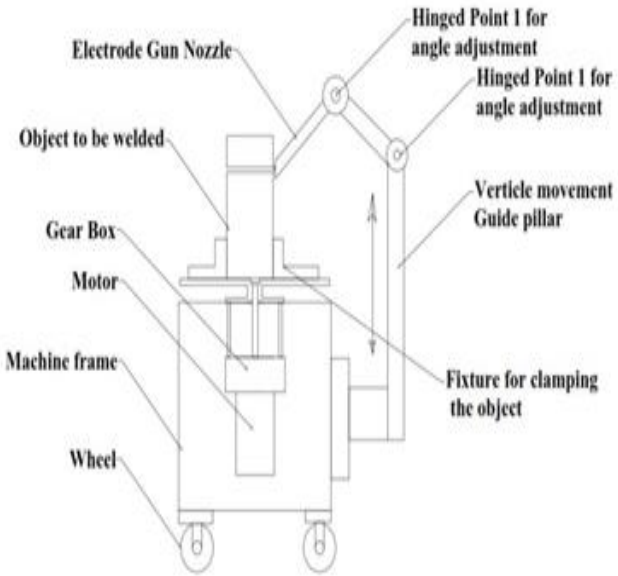
Methodology

1. Study of different research papers
2. Line diagram of project
3. Deciding dimensions and specifications
4. Assembling components
5. Results and discussion about errors

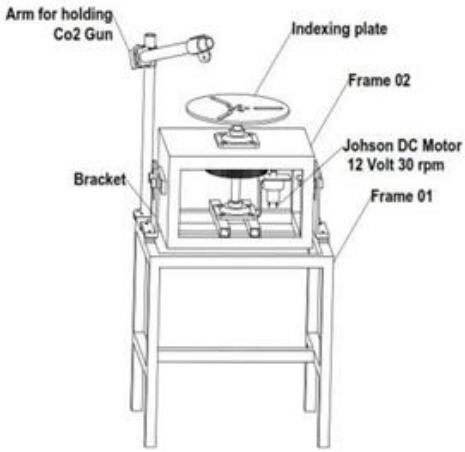
Components

1. Mounting table.
2. Rotating disc to place the job.
3. Job holding stand.
4. Rpm controlled gear motor.
5. Gear motor to control auto feed of filler material.
6. Torch holding stand.

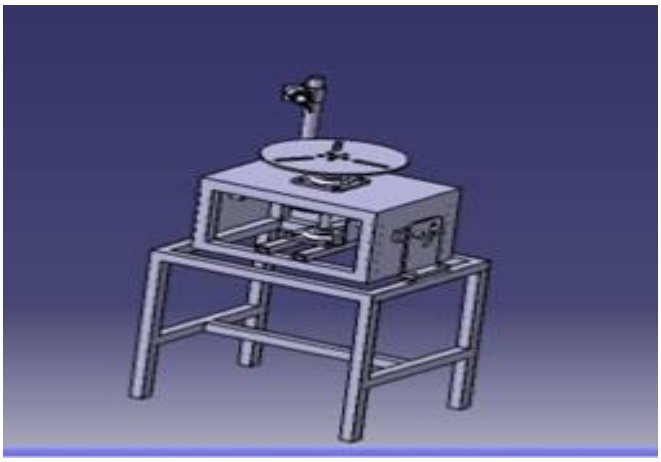
Block Diagram

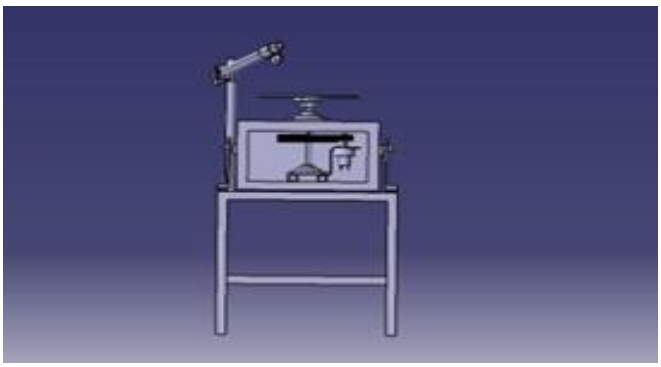


Experimental Setup



CAD MODEL





II LITERATURE REVIEW

"Special Purpose Machine for Linear Welding"

Prof.Shendage Yogesh.R1,Maske Dikshant P2, Kawachat Nivruti C3. (NCRIME-2018)

Abstract: In today's edge of technology the demand for precision is increasing. The traditional methods are replaced by automation to increase accuracy and precision, increase the

quality of welding, incorporation of the semi- automated welding machine is done for. Certain applications. For that, different parameters and methods have tobe considered from different research papers for the welding machine for selection of mechanisms like controller, welding process, weld angle etc. to get accuracy and quality weld. The technical constraint that has to be considered while designing and developing the machine is to achieve the stability, degree of freedom, linear and angular motion, and uniform speed of the welding torch for feed and uniform thickness of weld for quality product.

Fu-senRen Xiao-zehad developed a new type of special welding robot, which mixed the design method of series and parallel and realized the integrated design of organization for robot and anchor. The robot kinematics is built and realizes the real time control of welding torch position, orientation and welding speed during the welding process.

A.M.Vaid y a and P. M. Padole had calculated the flexibility of the links and joint stiffness. Zhao Yang has described the effect of plasma torch scanning frequency on temp. Distribution at molten pool surface. In simulation plasma torch power is 750 kW, melting rate is 300kg/hr the torch scanning frequency changes from 0.0833 Hz to 0.5 Hz.

ION Lucaciu had worked on a welding head enabling vertical positioning of welding wire relative to electrode position, adjusting the lead angle when entering into a metal bath or turning device for bringing the welding wire in front of or behind the torch according to direction of welding.

R. Xiao has worked on the function of the pressing wheels device to provide the clamping force to sheet plates through a pressing wheel rolling on the surface of sheet plates which is generated by a compressed spring. The position sensors are used to indicate the position of the compressed spring. On other hand, they are necessary for connection and support for the components of clamping devices. The region of compact force of spring device is designed from 50 N to 500N which can basically meet requirements in actual welding.

Irfan Sheikh et. al - studied the MIG welding parameters are the most important factors affecting the quality, productivity and cost of welded joints, Weld bead size, shape and penetration depend on a number of parameters. The quality of a welded joint is directly influenced by the welding input parameters.

III WORKING

1.The Gear Controlled Motor Rotates the workpiece that is mounted.

2.Speed of the rotation varies with cylinder diameter.

3.TIG Torch is fixed to a holding stand that remains fixed.

4.Welding is carried out around the circumference of the work pieces (cylinders) to be welded.

5.The auto feed mechanism feeds the filler material.

6.Uniform welded joint is obtained.

IV FUTURE SCOPE

It will play vital role in mass production system and in following process like painting, air washing, wire winding, circle marking, any geometrical shape welding, act as indexer, CO2 welding of circular or staggered welded joints, electric arc welding of circular or staggered welded joints, plastic moulding for multiple position dies, bottle filling plants etc.

V CONCLUSION

Heavy load capacity of the table is 80 kg safe load Adjustable table speed (0 to 75 rpm) Auto stop feature, to start and end process operational precise positions. Multiple indexer positions (6) , enables to make staggered welded joints. Easy operation, as the table automatically stops as per indexer button position and next operation is started by merely pressing the inching switch. Compact, the entire drive assembly fitted below the table itself, and the controls are placed on the front at ergonomic positions. Low power consumption (50 watt) From above report it is concluded that for the complete circular welding as well as the spray painting in required sangle with perfection and efficiently in mass production.

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REFERENCES

1.Mandal, N. R. (2004), Welding and Distortion Control, Narosa.

2.Needham, J.C., (1978), (Tech. Dir) Advances in welding process, 4th Int. Conf. Herrogate, IW Cambridge, London.

3.Nikolaev, G., and N. Olshansky, (1977), advanced welding processes, mir pub., Moscow.

4.Automated welding systems, All-in solutions from a one-stop supplier, FRONIUS USA LLC, sales@fronius.com, www.fronius.com

5.A comparative study on electron beam welding and rigid restraint thermal self-compressing bonding for Ti Yunhua Deng, Qiao Guan, Bing Wu, Jun Tao, 25 March 2015.Copyright@ elsevier.com