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Research On Design and Fabrication of Semi-Automatic Welding Machine

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Abstract — Developed countries are more focused to bring automation in every sector of production. In certain time the welding process is rapidly takes a place in automation. This has immensely helped them in reducing production time, wastage of material, etc. Automation in welding provides accuracy, quality as well as requires less time and man power. It is needed to enhance the old machineries by automating them in order to get more benefits. In manual TIG/MIG welding process the production rate is less & due to the non-uniformity in the linear motion, the accuracy and quality of welding gets adversely affected. That's why we are going to implement a corner welding machine in which the linear welding can be done at different angle. We put automation in linear motion and the angular motion in welding torch. We can adjust the height and rotary motion by manually. In case of this mechanism, the motion is uniform while welding & it helps to avoid the pits and bulges forming due to an-uniformity in the movement of welder's hand.

Keywords- Semi Automatic, Angular Welding, Corner Joint Welding, Linear Motion Welding, Variable Frequency Drive (VFD).

I. INTRODUCTION

Welding is a fabrication procedure used to link materials. Throughout welding, the pieces to be joined (the workpieces) are melted at the joining boundary and typically a filler material is supplementary to form a pool of molten material (the weld pool) that coagulates to become a strong joint.

There is a lots of less innovation in machineries in our countries, like other developed countries. Traditional methods for production is been utilized instead of automated machine. Automation in machine helps lots in the production line. Automation can deliver many advantages in the production line such as decreasing the time for production, wastage of materials can be easily controls, etc. Besides that automation also provides quality, accuracy, less manpower, etc. By means of the traditional methods which is rather benefits to the small scale industries, small scale industries do not refers the automation machine or special purpose machine for their requisite works.

MIG Welding (Metal Inert Gas welding):

Gas metal arc welding (GMAW), sometimes referred to by its subtypes metal inert gas (MIG) welding or metal active gas (MAG) welding, is a welding process in which an electric arc forms between a consumable wire electrode and the workpiece metal(s), which heats the workpiece metal(s), causing them to melt and join. MIG welding is a process that uses a continuously feed of solid electrode and shielding gas from an externally supplied basis, and electrical power to melt the electrode and deposit this molten material in the weld joint. The apparatus used automatically regulates the electrical characteristics of the arc. The only manual controls requisite of the welder for semi-automatic operation are travel speed, travel direction and gun (torch) arranging. Given proper equipment settings, the power supply will provide the necessary amperage to melt the electrode at the rate required to keep the pre-selected arc length (voltage). For example, an increased stick-out, created by drawing the torch back from the work piece, results in a reduction in current from the power supply. This keeps the same heating of the electrode and returns the arc length to its current condition. Filler metal range should be closely in line to the base material being welded. In MIG Welding, the filler metal not only conducts current to the arc zone (resulting in melting the base metal and electrode), but adds reinforcement to the completed weld joint. MIG Welding can be used on a wide variety of metals and in a number of different base metal thicknesses. For most of its applications gas metal arc welding is a fairly simple welding process to learn requiring no more than a week or two to master basic welding technique. Even when welding is performed by well-trained operators weld quality can fluctuate since it depends on a number of external factors. All GMAW is dangerous, though perhaps less so than some other welding methods, such as shielded metal arc welding.

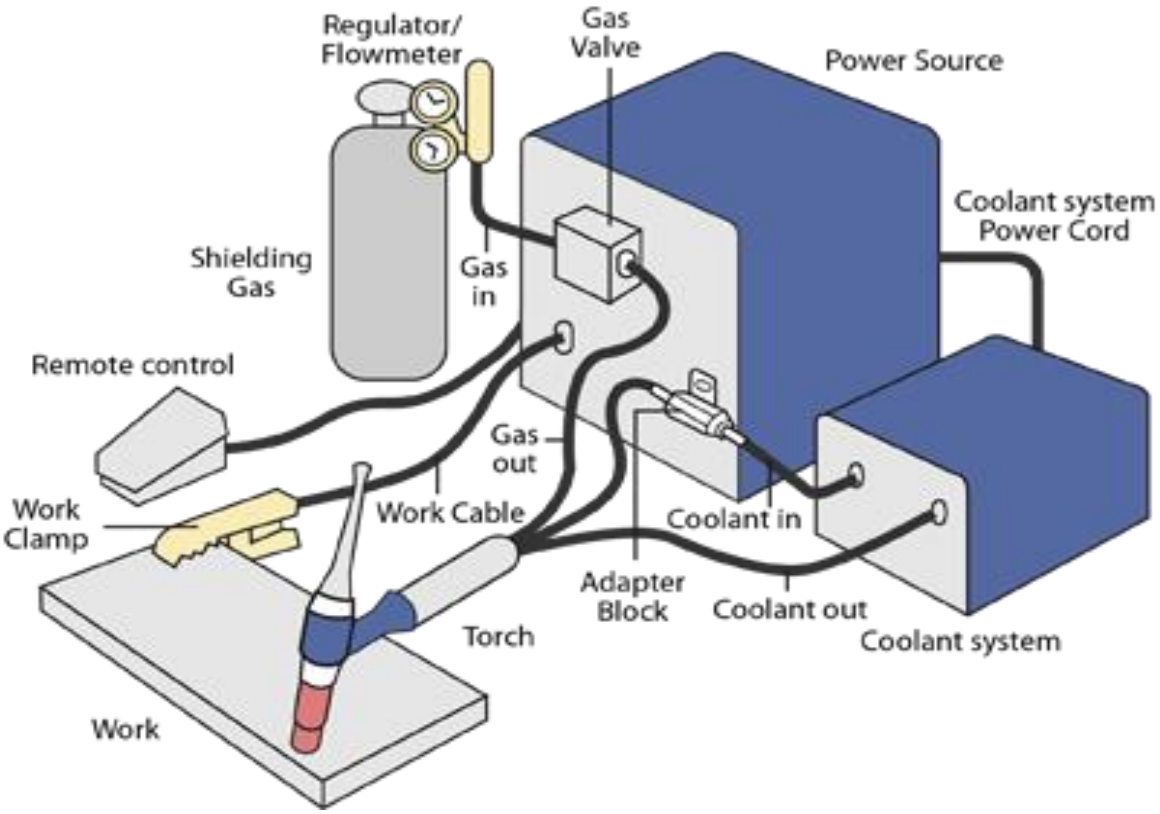

Figure 1. Metal Inert Gas Arc Welding

II. AIM & OBJECTIVE

The aim and objective of our project is to prepare the semi-automated angular corner joint MIG welding machine with help of automation the welding process which will be improved with minimum levels of defects with controllable feed from the filler material. We are giving our machine 6 different motion which easily at particular direction due which there will be increased in the degree of freedom which will increased its flexibility. The welding process will be carried out by controlling it through the VFD controller, Pneumatic system, and sensors.

III. METHODOLOGY

[1] AutoCAD 2016 for Designing
[2] Formula of Trigonometry
[3] Formula of length of Arc
[4] Law of Pythagoras
[5] Metal Inert Gas arc welding
[6] VFD for control the Automation
[7] Manufacturing of system

IV. DESIGN & ACTUAL WORKING MODEL

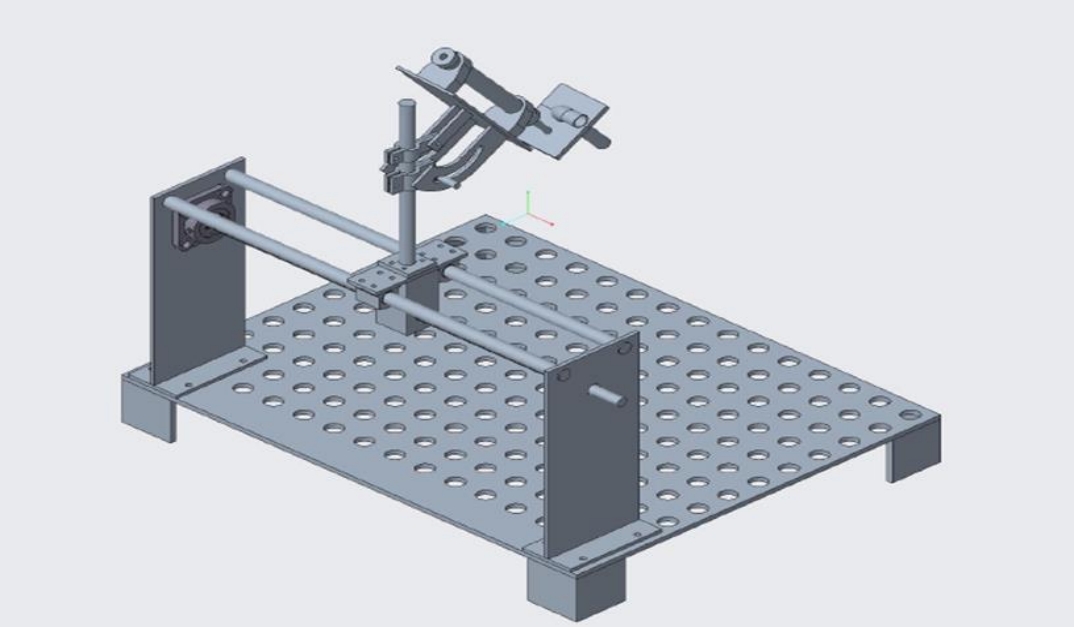

Figure 2. Design

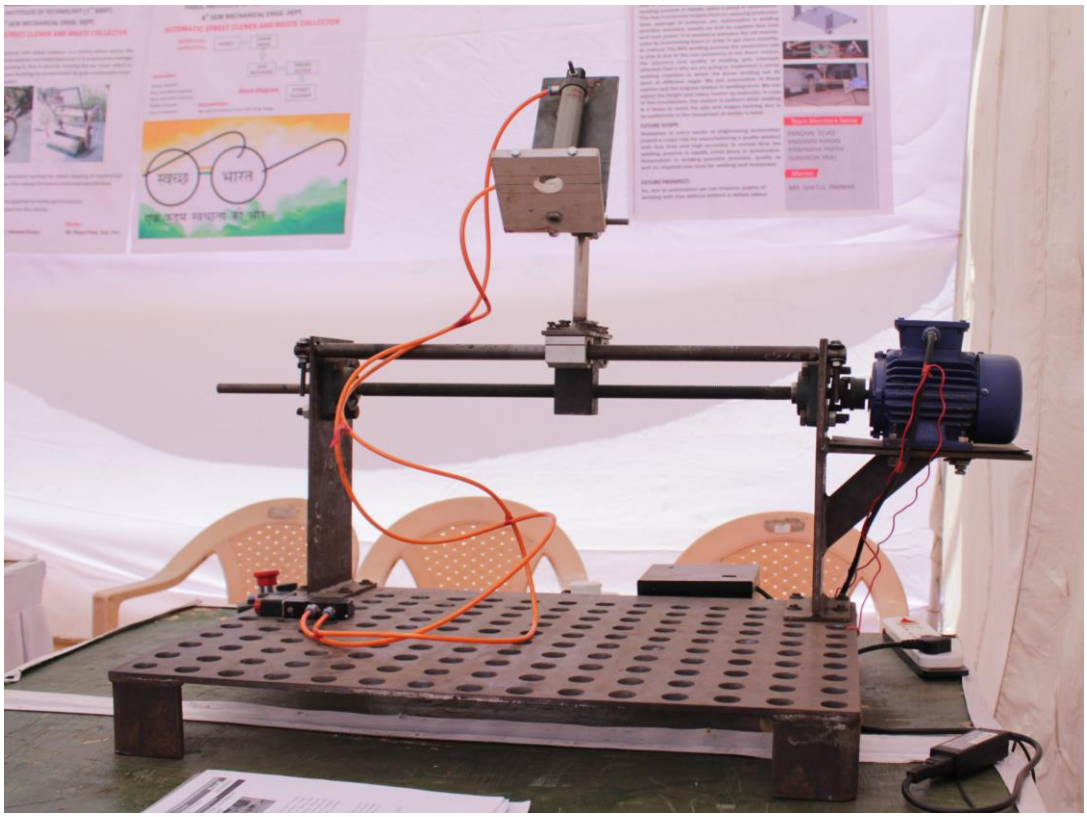

Figure 3. Design

V. RESULT

We found that Actual figure differs from the Expected. As expected is starting it would covered some distance as given rpm, but in actual it does not even move up to 80 rpm. It increases slowly as we increase the rpm. But we can't get the expected result due to load of the parts on the shafting. According to the thickness of the sheet metal, rpm is given to the motor through the VFD. As the thickness is lesser, more rpm is required because at less rpm the plate may get affected due to over burning of welding torch. If thickness of Sheet metal is more than 4 mm, than rpm given is less because the proper feeding can't be done at high rpm. So, according to the thickness of the sheet metal rpm is provided to the motor. Welding for sheet metal also depends on the angle of the welding torch. According to different thickness of the sheet

metal angle is provided to the welding torch. Angle is necessary because it helps the welding torch for proper feeding of welds to the sheet metal. When thickness of the sheet metal is less than the angle provided is also less below 40 degrees. As the thickness of the plate increase the angle of the welding torch also increase.

III. CONCLUSION

Due to the automation using VFD the weld accuracy and quality is increase with controllable linear motion of Welding torch with precise feed of work with less time utilization. By means of 6 degree of freedom the flexibility offers Ease of operation for moving the welding torch smoothly with appropriate adjustment of height, Angle, length etc. For Proper penetration of filler metal in different thickness of sheet metal parts with quality surface finished work is acquired by Angular welding. From this we obtained a quality welding technique by means of accurate surface finished worked with less welding defects is achieved.

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