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Controlling of Welding Fixture using PLC

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ABSTRACT: Metal Inert Gas (MIG) welding or Metal Active Gas (MAG) welding, is a process in which an electric arc is formed between an electrode wire and the work piece metal, which causes them to melt due to the heat and they are joined. The process can be semi-automatic or automatic. The presence of gas shields the wielding process form the contaminants present in the air, when electrode wire is applied to the work piece. In case of MIG/MAG welding constant voltage, direct current power source is commonly use, but constant current systems as well as alternating current can be used. It is a faster and economical welding process. Programmable logic control (PLC) is used to perform complex tasks of controlling the welding machine and its process, making it semi-automatic and easy to handle. The code for PLC is usually written in Ladder diagram logic and its software varies according to the PLC manufacturer.

KEYWORDS: Programmable logic control; Electrode; Total integrated automation;work piece;

I. INTRODUCTION

Now a days what the industry wants is more efficiency and less wastage. The current welding machine used in industry is not that efficient as during the welding process if the welding electrode gets over, the motor controlling the welding fixture still rotates therefore making partial welding of the work piece this results in wastage of the material and also the work piece. A mechanism is needed to reduce this wastage. This mechanism should work in such a way that the motor controlling the welding fixture must stop as soon as the welding electrode gets over. A voltage amplifier circuit is introduced in the system to stop the motor. By doing so the efficiency of the system will be increased.

The data presented in this paper gives information on CO2 welding process which is controlled using PLC. In this process two same or different types of metal sheets are joined without applying pressure. Due to its low cost strength and reliability this process is generally preferred joining technique [1].To rotate the job a special purpose machine (SPM) is used. It is used to rotate the wok piece in clockwise and anti-clockwise direction. It also helps to improve the precision of welding [2, 3]. In this process to control the SPM and welding machine, SIMATIC S7-1200 PLC is used [4, 5]. A voltage amplifier using LM324N, required for stopping the SPM is used and its circuit diagram is shown in Figure 3.

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II. PROPOSED BLOCK DIAGRAM

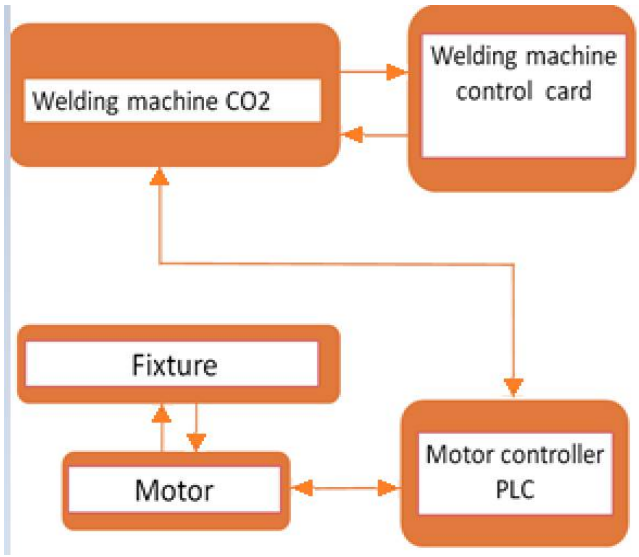
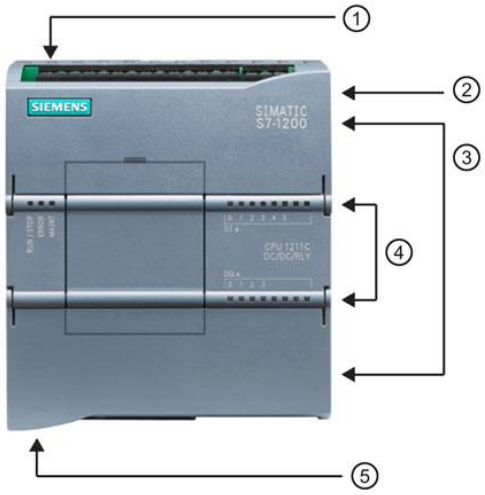


Fig 1: Block diagram of Controlling of welding fixture using PLC

III. SIMATIC S7-1200 PLC

We are using SIMATIC S7-1200 PLC in this project. It provides power and flexibility to control a wide variety of devices. The CPU consists of an integrated power supply, a microprocessor, input and output circuits, on-board analog inputs, built-in PROFINET and high-speed motion control I/O all combined to create a powerful controller. After downloading the program, the CPU consists of the logic required to monitor and control the devices in your application. The CPU changes the input with respect to the changes in output [4].



1.Power connector

2.Memory card slot under top door

3.Removable user wiring connectors (behind the doors)

4.Status LEDs for the onboard I/O

5.PROFINET connector (on the bottom of the CPU) [4].

Fig 2: S7-1200 PLC with naming

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IV. VOLTAGE AMPLIFIER CIRCUIT

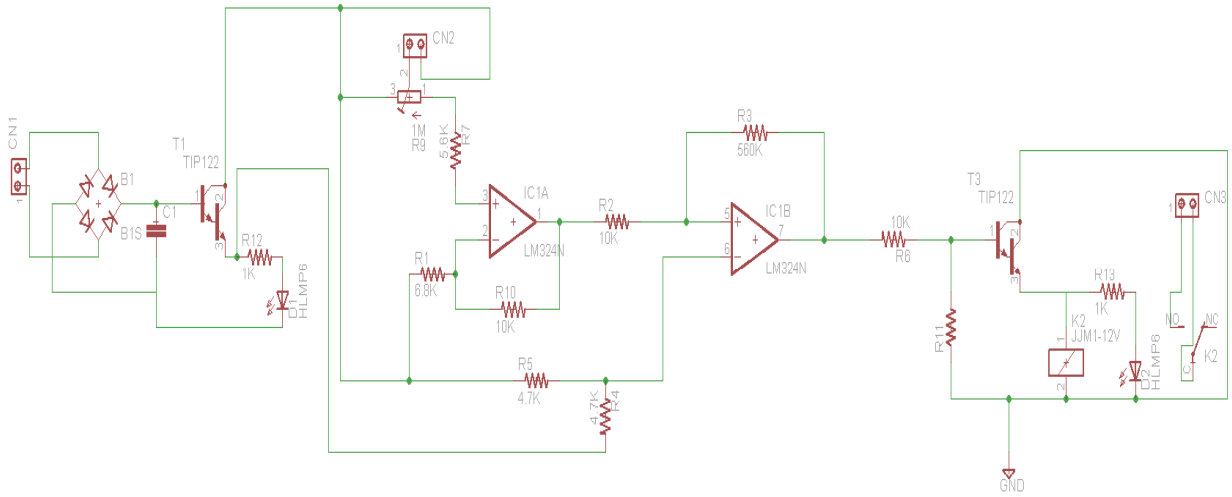

Fig 3: Circuit Diagram of Voltage Amplifier

This circuit is connected across the shunt of the welding machine circuit and during welding process it receives mili volts and converts it into volts and it is given to the PLC. If the electrode is finished when the welding is taking place the voltage amplifier circuit will stop getting the mili volts supply and the PLC will then stop the SPM.

V. TOTAL INTEGRATED AUTOMATION PORTAL (TIA) SOFTWARE

The Step 7(TIA portal) is used in engineering SIMATIC S7-1200 basic controllers and HMI panels. Here we created a program to stop the SPM, which here is a servo motor, as soon as the electrode gets finished [5].

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The program is as follows

Totally Integrated Automation Portal

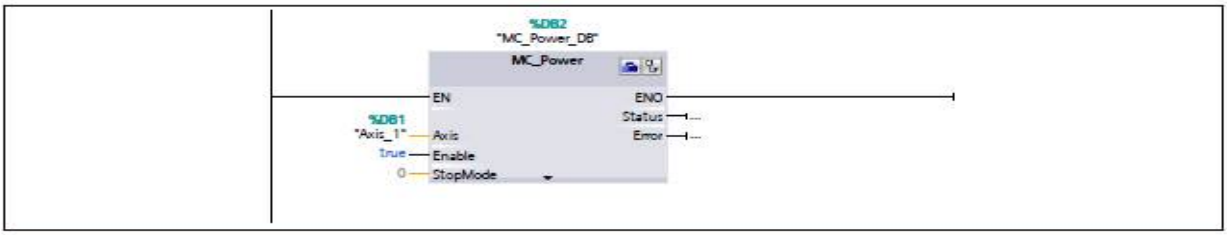
servo new / PLC_1 [CPU 1214C DC/DC/DC] / Program blocks

Main [OB1]

Main Properties					
General					
Name	Main	Number	1	Type	OB.ProgramCycle
Language	LAD				
Information					
Title	"Main Program Sweep (Cycle)"	Author		Comment	
Family		Version	0.1	User-defined ID	

Name	Data type	Offset	Comment
Temp			

Network 1:



Symbol	Address	Type	Comment
"MC_Power_DB"	%DB2	Block_FB	
"Axis_1"	%DB1	Multi_FB	

Network 2:

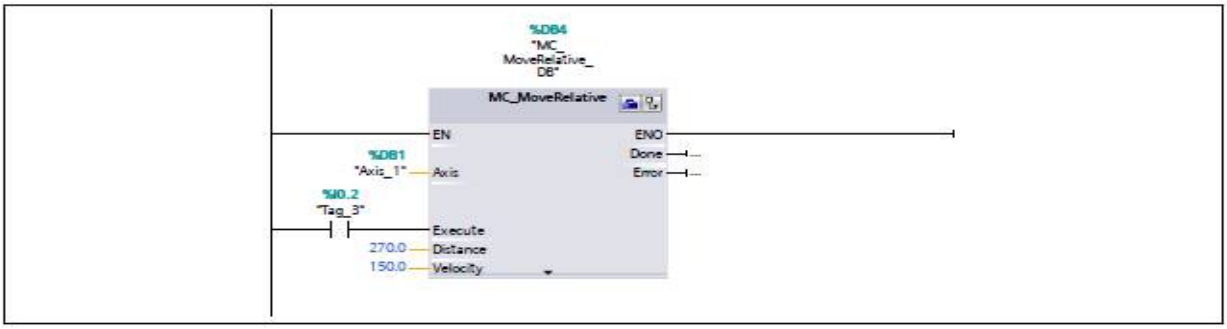


Fig 4: PLC program part 1

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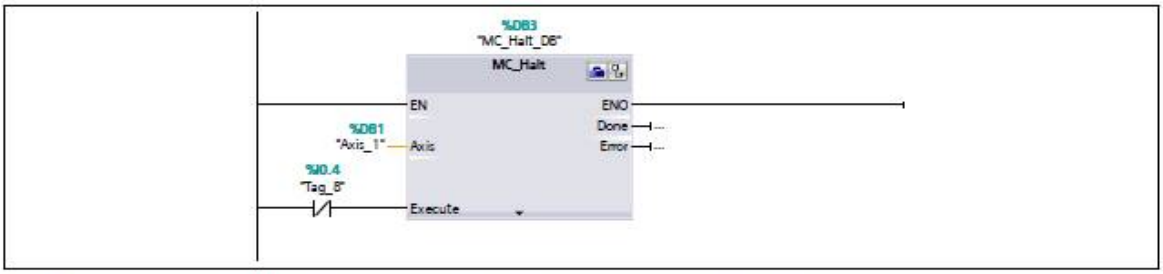
Totally Integrated Automation Portal

Symbol	Address	Type	Comment
"Axis_1"	%DB1	Multi_FB	
"MC_MoveRelative_DB"	%DB4	Block_FB	
"Tag_3"	%I0.2	Bool	

Network 3:



Symbol	Address	Type	Comment
"Axis_1"	%DB1	Multi_FB	
"MC_Halt_DB"	%DB3	Block_FB	
"Tag_8"	%I0.4	Bool	

Fig 5: PLC program part 2

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VI. CONCLUSION AND FUTURE WORK

Conclusion is drawn on the basis of the information collected on each aspect of our project. It leads to a belief that if applied will create an even better machine than we have designed. The process of conducting operations related to welding fixtures and fixtures helps in gaining a deeper understanding as well as effective project process. The prototype construction proves fruitful in analyzing the process for its potential as a finished product. This project tries to reduce the error happen in the welding machine which is found to be very efficient method. By using PLC we can improve the rate and efficiency of CO2 welding machine. Here we are using PLC S7-1200 for minimizing the error as the software used in this project is TIA. To determine the time for which welding should be stop and in this project are using NO (normally open) NC (normally closed) switch for to run and to stop the system. By introducing automatic work piece, pick and place machine more man power will be reduced which can also be controlled with the help of PLC.

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