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Design Of Automatic Welding Machine For Increase Productivity Of Welding Components.

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Abstract:
Background*: Safety is a crucial component of welding. One of the most popular ways to fabricate metal in the world today is welding. When performed in a regular and proper workshop environment, welding is a safe activity. However, it must be noted that having equipment free from flaws and a neat, well-lit, and well-ventilated workspace are crucial components of a safe working environment.*
Even though welding is commonly practiced around the world, when certain fundamental safety procedures and guidelines are not followed, it can cause workers' injuries, discomfort, long-term eye loss, and occasionally even death.
Materials and Methods*: The modern industry uses a wide range of welding and related operations. Fusion welding and solid state welding are the two main categories into which welding operations can generally be separated. The way that heat, pressure, or both are delivered throughout these processes, as well as the machinery involved, vary. In most industries, 60–70% of welding operations are performed using shielded metal arc welding (SMAW), submerged arc welding (SAW), and gas metal arc welding (GMAW). Welding is a practical and appealing procedure in contemporary industries due to its simplicity, adaptability, and efficiency.*
Results*: The main outcome of this work is to minimize labour work with replacement of automatic robotic system.*
Conclusion *Multiple indexer positions, enables to make staggered welded joints. Easy operation, as table automatically stops as per indexer button position and next operation is started by merely pressing the inching switch.*
Key Word*: Automatic welding processes, Time study, Method Study etc.*

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I. Introduction

In the era of mass production, data is frequently needed to automate formerly manual industrial processes. Numerous welding procedures, including CO2 welding, electric arc welding, and TIG (tungsten inert gas welding), use a variety of welding techniques. However, in many cases, we use techniques that do not operate effectively or accurately. It takes skill to move the electrode along the welding line, and it is made significantly more difficult for circular components. By employing high heat to melt the components together and letting them to cool, which causes fusion, welding is a fabrication or artistic method that unites materials, typically metals or thermoplastics. Welding differs from lower temperature welding.

The energy utilized for welding can come from a variety of sources, such as a gas flame (chemical), an electric arc (electrical), a laser, an electron beam, friction, and ultrasound. While welding is frequently an industrial activity, it can also be done in a variety of other settings, such as the open air, underwater, or even in space. Welding is a risky process, thus safety measures must be taken to prevent injuries like burns, electric shocks, visual loss, inhalation of toxic fumes, and exposure to strong UV rays. Forge welding, which blacksmiths had been using for millennia to unite iron and steel by heating and hammering, was the only method of joining metals until the end of the 19th century. Late in the century, the first processes to emerge were oxy-fuel welding, electric resistance welding, and arc welding followed soon after.

II. Problem Statement:

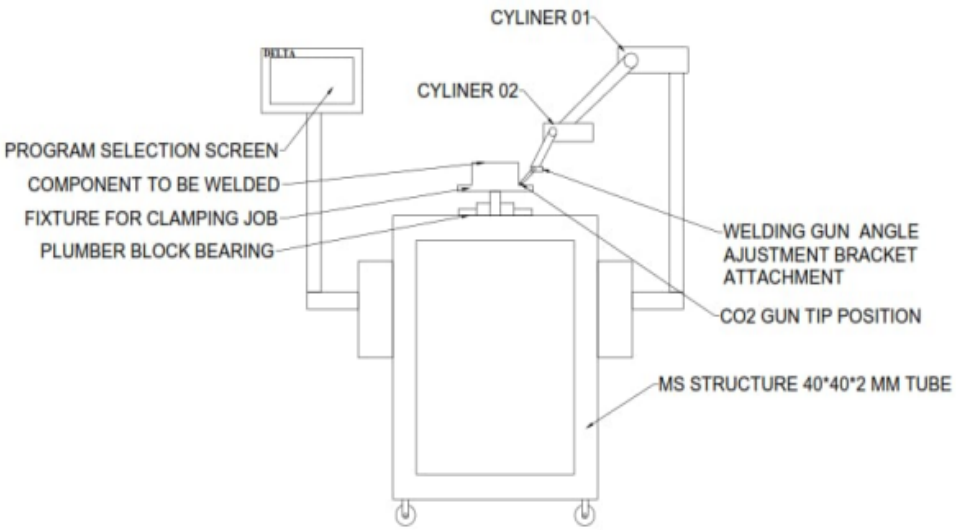
1. In multiple welding or sometimes electric arc welding the need often arises for welding of circular shape Components, where the welding is carried out on the entire periphery or an partial arc length of the job.
2. The electrode is thus moved along this circular path in the conventional method.
3. Movement of the electrode is much more difficult and it is much easier to index the job.
4. For welding the current work piece cycle, time is higher i.e. 45-60 sec. So need to develop such a system for easy work piece loading and auto welding gun.

Fig.01 Actual Job Image

Three key benefits of robotic welding systems are

1. Improved output, uniform weld quality, and reduced variable labour costs. Stable weld quality. The Welding process involving the magnet coils requires a lot of manual labour. The quality of the majority of labor-intensive tasks tends to deteriorate over time.
2. A robotic system is not susceptible to fatigue and can continue producing high-quality welding for extended periods of time.
3. Robotic systems with a good design can replicate any taught action and produce accurate results. Due to the variety of magnet configurations and the frequent use of each configuration, this characteristic is Crucial.

III. Experimental Setup



The job to be welded is placed on the indexer table and considering the welding process and electrode feed rate the speed regulator is adjusted to give desired table speed. The table carries indexer buttons as per no of welds and position of the same. Table is indexed to the first stop position. Now by pressing the single switch all the operation will start working simultaneously. Such as

1. Griping work piece.
2. Location the welding nozzle.
3. Initiating the welding.
4. After 360 angle completion, relay off machine off the welding process Welding gun

moves to its initial position.
5. Job ready to unload.
6. Buzzer blinks for 2 sec.
7. Process completed**.**

IV. Objective of Project Work:

1. The main purpose of this research is to develop this system & In order to approach this purpose, we follow.
2. Design the indexing table rotary motion of component to be welded.
3. Load caring capacity up to 25 kg. Material procurement & Drawing Release for manufacturing.
4. Fixture design for welding gun fitment for angular motion during loading & unloading of job.
5. Utilization of pneumatic cylinder for griping job / locating the welding gun.
6. Testing & complete of complete project within prescribed time.

V.Factors to be considered during system Design:

· Reduced errors.
· Cost saving.
· Increased productivity.
· Uniform and precise welding.
· Reduced labour requirement.
· Increased machine utilization.

VI. Calculations

By robotic welding calculation:
1 hour = 60 min, 8 hour = 8×60= 480 (28800 sec)
Welding time for 2 inch job = 79sec
Loading + unloading = 10sec
Total time = 89 sec

Daily production as per this =28800÷89
=323 jobs/day

Monthly calculation = 323 × 25 days
= 8075 jobs/month

Yearly calculation = 8075 × 12
=96900 jobs/year

By manually welding:-

Worker do 2 inches job manually in 135 sec.
Welding time = 135 sec
Loading and unloading time = 15 sec

Daily production as per this = 28800÷150
=192jobs / day
Yearly calculation = 5760×12
=69120 job/year

Monthly and yearly calculation:
Cost of 1 job for welding is 50 rs.
Yearly welding cost of automatic welding = 96900 jobs × 50 rs
= 48, 45,000 Rs
Yearly welding cost of manual welding = 69120 jobs × 50 rs
= 34, 56,000 Rs

Overall company makes profit of around 13, 89,000 Rs annually.

VII. Results and Discussion

- The main outcome of this project is to minimize labour work with replacement of automatic robotic system.
- The accuracy of welding is better than manual work.
- This system will help in future reduce.

Table.2-Manual Production Rate

MANUAL WELDING PRODUCTION RATE			
Total Reading		**QTY**	**TIME (HRs)**
01	**2 INCH JOB**	**192**	**8**
02		**189**	**8**
03		**193**	**8**
04		**190**	**8**
05		**192**	**8**

Table.3-Automatic Production Rate

AUTOMATION WELDING PRODUCTION RATE			
Total Reading		**QTY**	**TIME (HRs)**
01	**2 INCH JOB**	**192**	**8**
02		**189**	**8**
03		**193**	**8**
04		**190**	**8**
05		**192**	**8**

Table.4-Welding Cycle Time

	WELDING CYCLE TIME	**LOADING**
MANUAL	**135**	**10**
AUTOMATED	**79**	**05**

Table.5-Total Profit of the company

Sr.No.	**Particular**	**Profit Rupees**
1	**Total Profit to the company yearly**	**13,89,000 /-**
2	**Wages of Workers yearly**	**2,70,000 /-**
3	**Expenditures on Safety Equipments of Workers yearly**	**10,000 /-**
4	**MSEB bills yearly**	**84,000/-**
5	**Raw material charges**	**90,000 /-**
6	**Other charges**	**50,000/-**
7	**Net Profit to the company**	**8,85,000/-**

VIII.Conclusion

1. Job productivity increased up to 2 to 3 times.
2. Labour work reduced due to machinery.
3. Heavy load capacity of table is 80 kg safe load Adjustable table speed (0 to 75 rpm) Auto stop feature, to start and end process operational precise positions.
4. Multiple indexer positions, enables to make staggered welded joints. Easy operation, as table automatically stops as per indexer button position and next operation is started by merely pressing the inching switch.
5. Compact, the entire drive assembly fitted below the table itself, and the controls are placed on the front at ergonomic positions.
6. Low power consumption (50 watt) From above report it is conclude that for the complete circular welding as well as the spray painting in required angle with perfectly and efficiently in mass production.
7. Heavy load capacity of table is 80 kg safe load Adjustable table speed (0 to 75 rpm) Auto stop feature, to start and end process operational precise positions.
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