Design and Fabrication of Automatic Wall Painting Machine

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Abstract - The primary aim of the project is to design and developing the Automatic Wall Painting machine, which helps to achieve low cost painting. Paint Contains high amount of chemicals can cause health hazards to the human painter which affect the human eyes and respiratory system in human body. Also the nature of painting procedure that requires repeated work can cause hectic to humans. Proposed system contains paint gun, chain link, movable platform, column and wheels. The system can paint up to 50 feet height. height adjustment and width adjustment can automatically controlled by using sensors. paint can load up to 20 litters in container per cycle. 20 litters of paint can cover 50 feet height and 50 feet length. The total system can run with 1hp single phase motor.

Keywords - Paint gun, chain link, sensors, container and platform .

I. INTRODUCTION

Automation plays a very important role in all fields of Engineering. The biggest advantage of automation is that is used to save power, energy and materials and to improve the quality, precision and accuracy. Building and construction is one of the major industries around the world. In this fast moving life construction industry is also growing rapidly. But the labors in the construction industry are not sufficient. This insufficient labors in the construction industry is because of the difficulty in the work. In construction industry, during the work in tall buildings or in the sites where there is more risky situation like interior area in the city. There are some other reasons for the insufficient labor which may be because of the improvement the education level which cause the people to think that these types of work is not as prestigious as the other jobs. The construction industry is labor-intensive and conducted in dangerous situations; therefore the importance of construction robotics has been realized and is grown rapidly.

Applications and activities of robotics and automation in this construction industry started in the early 90‟s aiming to optimize equipment operations, improve safety, enhance perception of workspace and furthermore, ensure quality environment for building occupant. After this, the advances in the robotics and automation in the construction industry has grown rapidly. Despite the advances in the robotics and its wide spreading applications, painting is also considered to be the difficult process as it also has to paint the whole building. To make this work easier and safer and also to reduce the number of labours automation in painting was introduced. The automation for painting the exterior wall in buildings has been proposed. Above all these the interior wall painting has shared little in research activities. The painting chemicals can cause hazards to the painters such as eye and respiratory system problems.

Also the nature of painting procedure that requires repeated work and hand rising makes it boring, time and effort consuming. These factors motivate the development of an automated robotic painting system. This project aims to develop the interior and exterior wall painting machine. This automatic wall painting machine is not designed using complicated components. This machine is simple and portable. The robot is designed using few steels, conveyor shaft, spray gun and a controller unit to control the entire operation of the machine. This machine is compact because of high speed and pressure capabilities they have.

They also have a very small weight to power output ratio and predictable performance i.e., losses are minimum due to less number of moving parts and so gives expected performance. Due to elegant and simple control systems it can control noise vibration and does silent operation and no vibration is produced. It has longer life, flexibility and it is efficient and dependable, and the installation is simple and the maintenance is also easy.

II. REQIREMENT OF PARTS

A The construction of the automatic wall painting machine consists of two main parts. They are

1.Mobile platform

- Frame stand
- Wheel
- DC motor
- Battery
- Control unit
- Warm Gear

2. Spray gun mount

- IR sensor
- Chain and Sprocket
- Flow control valve
- Spray gun
- Blower

A D.C. MOTOR

Almost every mechanical movement that we see around us is accomplished by an electric motor. Motors take electrical energy and produce mechanical energy. Electric motors are used to power hundreds of devices we use in everyday life. Motors come in various sizes. In most cases, regardless of type, electric motors consist of a stator (stationary field) and a rotor (the rotating field or armature) and operate through the interaction of magnetic flux and electric current to produce rotational speed and torque. In our systems 1 HP motor is used.

B WARM GEAR

The warm and warm wheel gear uses two spur gears one of small size and another larger size to achieve the speed reduction ratio. Most of the industrial systems uses the warm gear to achieve the speed reduction. The rotational speed from the D.C. motor is reduced to 30 RPM by this warm gear.

C CHAINS AND SPROKET

The shaft is attached to warm gear and sprocket. The rotation of gear will rotates the sprocket. The chain which is meshed with sprocket moves along the rotation of sprocket. The sprocket and chain moves with same speed as the gear speed.

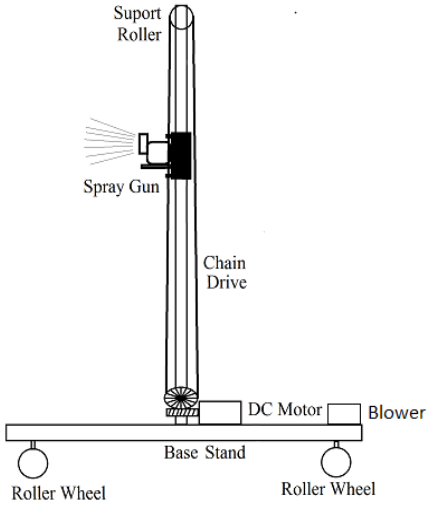
D SPRAY GUN

The table which is attached to the chains moves in vertical direction along with movement of chain. The sprayer is mounted on table. The movement of the table helps the sprayer to move along the path to paint all the area of the wall. The sprayer works with the help of blower to spray paint on wall surface.

E BLOWER

The helps the sprayer to spray the paint with its high velocity air. The blower works the power supply of 230V. Most of spraying applications uses compressor or blower as the main source. Here as well we use blower as main source to spray connected by flexible hose.

III. BLOCK DIAGRAM OF PROPOSED SYSTEM



IV. CALCULATIONS

A BLOWER

Max. pressure :1 x 10^5 N/m²

Fluid media : Air

Material :Plastic

B HOSE CONNECTORS

Max pressure : 10 x 10^5 N/m²

Outer diameter :12 mm = 12 x 10^{-3}m

Inner diameter :9.5 mm = 9.5 x 10^{-3}m

C WEIGHT

Base :

- Steel members = 3 kg =29.43 N
- Blower = 1.5 kg = 14.71 N
- Motor = 2 kg = 19.82 N
- Paint tank = 1kg = 9.81 N

Vertical channel

- Steel members = 4 kg = 39.24 N
- Shaft = 0.25kg = 2.45 N
- Sprocket &chain = 2 kg = 19.82 N

Vertical moving base

- Wooden plate = 0.5 kg = 4.90 N
- Sprayer = 2 kg = 19.82 N

Total weight = 160N

V. CONCLUSION

In Automatically paint the wall of given dimension has been designed and developed. The motor and blower is on

the paint will spray on the wall for designed dimensions. The developed machine eliminates the hazards caused by chemicals. The machine is cost effective, reduces work force for human workers, reduces time consumption. The higher end of the moving platform is indicated to the operator by using sensor which produces beep sound when sprayer reaches the highest area.

REFERENCES

[1] K.Kathirvel, R.Rajasekar, T.Shanmugarajan, "Development of calcium titanium oxide coated silicon solar cells for enhanced voltage generation capacity" vol. 35, no.1 , pp. 181–187, 2017.

[2] S.Selvakumar, K. P. Arulsri, K. S. K. Sasikumar, "Mathematical approach for optimal machining fixture layout and clamping forces" vol. 10, no.1 , pp. 17–28, 2012.

[3] A. D. Pathak, R. S. Warghane, " Development of Roller-Based Interior WallPainting Robot, World Academy of Science, Engineering and Technology " vol. 5, no.2 , pp. 5082–5090, 2018.

[4] Mustafa Kontpglu, Haci saglam," Investigation of progressive tool wear for determining of optimized machining parameters in turning" vol. 5, no.140 , pp. 427–436, 2019.

[5] K.Kathirvel, R.Rajasekar, T.Shanmugarajan, " Set up of a robotized system for interior wall painting " vol. 35, no.1 , pp. 181–187, 2017.

AUTHOR'S PROFILE

Mr. K. Kathirvel had completed M.E degree in Bannari Amman Institute of Technology in the year of 2012 and received gold metal. Ph.d research work in enhancement of power conversion efficiency of solar Cell. Published more than 3 papers in various journals and presented research work in more than 12 conferences. The published journals covers technical areas like solar cell, optimization and physical coating techniques. Servicing as an Assistant Professor in Kongu Engineering college for more than 86 months. Worked as an Engineering trainee in Quality Assurance and Development for one year in industry. Life member of ISTE and member of SAE.

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