Design and fabrication of ceiling painting machine

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I. ABSTRACT

Construction sector is responsible for a progress of any country, because most of the growth of the nation is depending upon industrialization, civilization, transportation etc. which compulsorily has their initial stage of building construction and painting. It is a biggest economic sector because of it the development trade in most countries amounts to 10-20% of the total national product, still due to labour demand and most of the work is repetitive it is a slow in manual process. So, for improving the economic growth of the country and indirectly developing the lifestyle of the country's people there must be need of improving the techniques of working. Painting ceiling requires more man power time. Since the risk of inhaling painting gases like toluene, ethyl acetate, glycol. So the project helps in safety of the labours also reduces the risk of falling from high during painting of celling.

II.INTRODUCTION

Despite the advances in robotics and its wide spreading applications, interior wall painting has shared little in research activities. The painting chemicals can cause hazards to the human 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. There have been few research projects in the literature but they did not produce a mature system acceptable by the market yet.

However, at present, most of those paintings are drawn manually. For the purpose of labour saving and improvement in work environments. it would offer the opportunity to reduce or eliminate human exposure to difficult and harmful environments, which would solve most of the problems connected with safety when many activities occur at the same time.

There are a lot of contributions pertaining to the improvement of efficiency and safety in construction, which are brought about by automation, provided it will be able to produce highly autonomous robots for building sites. Regarding the recent advancements in technology of automatic painting machines, there has been little development in making automatic machines with full automatic capability and the ones in the market as semi-automatic and require human assistance throughout their working. So we came up with the automatic celling painting model.

III. LITERATURE REVIEW

a. Development of Roller-Based Interior Wall Painting Robot

Experiments have shown an average duration of 0.101 hour/m for two layers of paint, which means a 10m width wall can be painted in 2.71 hours. This is based on an overlap of 4 cm, meaning that each stroke paints a strip of 17 cm width. Warszawsky and Kahane have concluded a 0.019 hour/m for two layers duration which is faster by 5.3 times. But their system requires an operator to mark the position of the first work station which is not required in this work. Also the weight of at least 500 kg limits the robot from domestic use. Aris have reported a 0.076 hour/m duration (without referring to the number of layers), which is faster than this work by 1.3 time. Photograph of the mobile platform to move the system. The implemented mobile platform was tested and succeeded in carrying the intended load while enabling the plane degrees of freedom.

b. Development of Wall Painting Robot

As above mentioned, Wall-Surface Operation Robot Machine has realized multiple applications on a wall. Tile separation sensing, so far, has been conducted by a man riding in a chair-shaped temporarily with an sensing bar with a ball attached on the edge, judges separation state from the sound. The work not only is dangerous as being carried out at an elevated spot but also tends to produce variation among inspectors as it totally depends on their experience and sense.Sensing through use of this robot was conducted by using two sensors including one for the transmission side and the other for the receiving side each capable to cover sound waves within the auditory sensation area, mounted wall by air cylinders.

c. Automatic Guided Wall Painting System

The prototype setup is devoid of wheels as performance was tested first using static laboratory pneumatic supply with Red Colored paint setup. Also, to control the flow of paint, a 24 V DCV with a relay switch controlled with the STM32 is used. For a prototype setup the dimensions were kept small with respect to the wall has better cost to output ratio than other similar work whilst Also, the prototype is devoid of autonomous navigation. Its movement has been restricted to moving in just one dimension. The final system setup has to fully capable of autonomously placing itself in xy plane and only then the ultimate objective of the autonomous and automatic painting will be realized. Hence, a localization setup is to be devised.

d.Set up of a Robotized System for Interior Wall Painting

The first encouraging result obtained from this work is relative to the feasible approach of the scalability of the problem: it allows to perform experiments with lower waste of raw materials, power supply and maintenance costs. Some complex arrangements of construction sites will be reproduced in future research and then robotized painting will be verified with particular attention to every parameter affecting the quality of the final work.

e.Paint Spraying Machine

In still other prior systems, the object after having been painted was removed manually. In such prior systems, no mechanism was provided for automatic ejection of the object subsequent to the painting operation. Thus, there was a loss in operating time for the system when the object had to be removed and a new object inserted into such prior painting systems. In other prior paint systems, the main operating components were in the path of paint being sprayed on the objects to be painted

f. Automation and Robotics in Construction

Initially, robots were developed for the manufacturing industry and were intended to perform routine task in a very familiar environment. Unlike such robots, those designated for work on construction sites must be mobile, maneuver in changing environments, and perform a different task at almost every step. Construction engineering is changed by the application of more industrial production, sustainable production, mass individualization, and intelligent building to improve constructability.

IV. COMPONENET DESCRIPTION

a. Pneumatic Cylinder

Pneumatic cylinder sometimes known as air cylinders are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion.Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage.Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement

b.Wheel

The wheels are used for the movement of the machine. Normal wheels are used for reduction of the cost and most conventionally used. These wheels move according to the axis of the movement. It moves by the signal received. Dc motor is used for the movement of the vehicle. The scissor lift is used for the lifting of the spray unit to the celling.

Pneumatic cylinders are used for the lifting the scissor lift for the required height. The container contains the paint. The compressor unit compress the air with the paint and spray it in the ceiling. The paint is sprayed by the nozzle and the rollers are used to obtain a smooth finishing of the ceiling.

c.Air Compressor

Air compressor supplies air into a nail gun. An air compressor is a device that converts power (using an electric motor, diesel or gasoline engine, etc.) into potential energy stored in pressurized air (i.e., compressed air). By one of several methods, an air compressor forces more and more air into a storage tank, increasing the pressure. When tank pressure reaches its engineered upper limit, the air compressor shuts off. The compressed air, then, is held in the tank until called into use. The energy contained in the compressed air can be used for a variety of applications, utilizing the kinetic energy of the air as it is released and the tank depressurizes. When tank pressure reaches its lower limit, the air compressor turns on again and re-pressurizes the tank.They consist of a piston, connecting rod, crankshaft, cylinder, and valve head. The air is compressed in the following manner: The valve head at the top of the compressor tank draws air in by the downward movement of the piston in the cylinder

d.Scissor Lift

The electric- or gas-powered platform that is mounted on folding arms is used to provide elevated work areas or to help raise or lower unit loads. The objective is to access difficult-to-reach areas in order to perform whatever work is required. Scissor lifts provide a mobile means of reaching areas that are very high. Scissor lift is one of the most frequently used aerial work platforms which is required to work at heights safely. It is useful to perform not only various tasks such as cleaning and painting, but also it is used in many construction and industrial installation application.

This mechanism is used in devices such as lift tables and scissor lifts. Modern low-profile computer keyboards make an extensive use of it as well, installing each key on a scissor support to ensure their smooth vertical movement, allowing the use of a cheap and reliable rubber dome contact set, instead of expensive and complex array of mechanical switches. As shown in the fig4.6 scissor lift is used to lift the entire system

e.Nozzle

A nozzle is a device designed to control the direction or characteristics of a fluid flow (specially to increase velocity) as it exits (or enters) an enclosed chamber or pipe. A nozzle is often a pipe or tube of varying cross sectional area, and it can be used to direct or modify the flow of a fluid (liquid or gas). Nozzles are frequently used to control the rate of flow, speed, direction, mass, shape, and/or the pressure of the stream that emerges from them.

V. DESIGN

As shown in the fig 5.1 Wheel is connected to the shaft. Shaft is connected to the frame. Pump is connected to tube. Scissor lift which is connected to the frame. Lead screw which is connected to the tube. Lead screw is also connected to nozzle. This is design made with use of Auto cad ver2017

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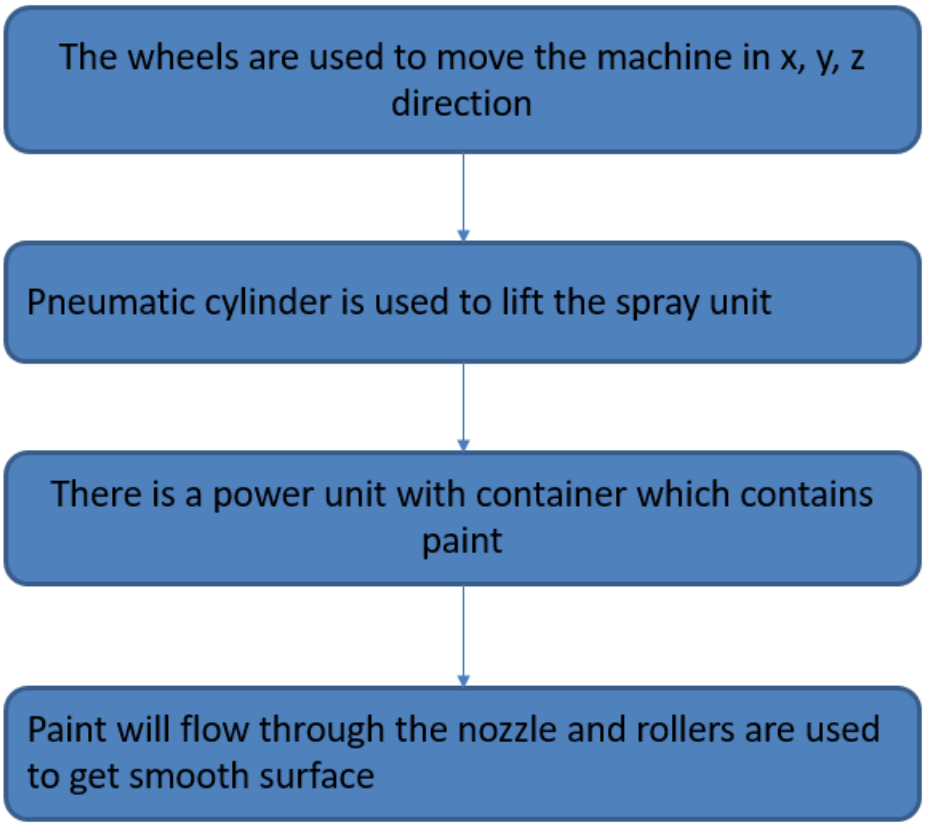

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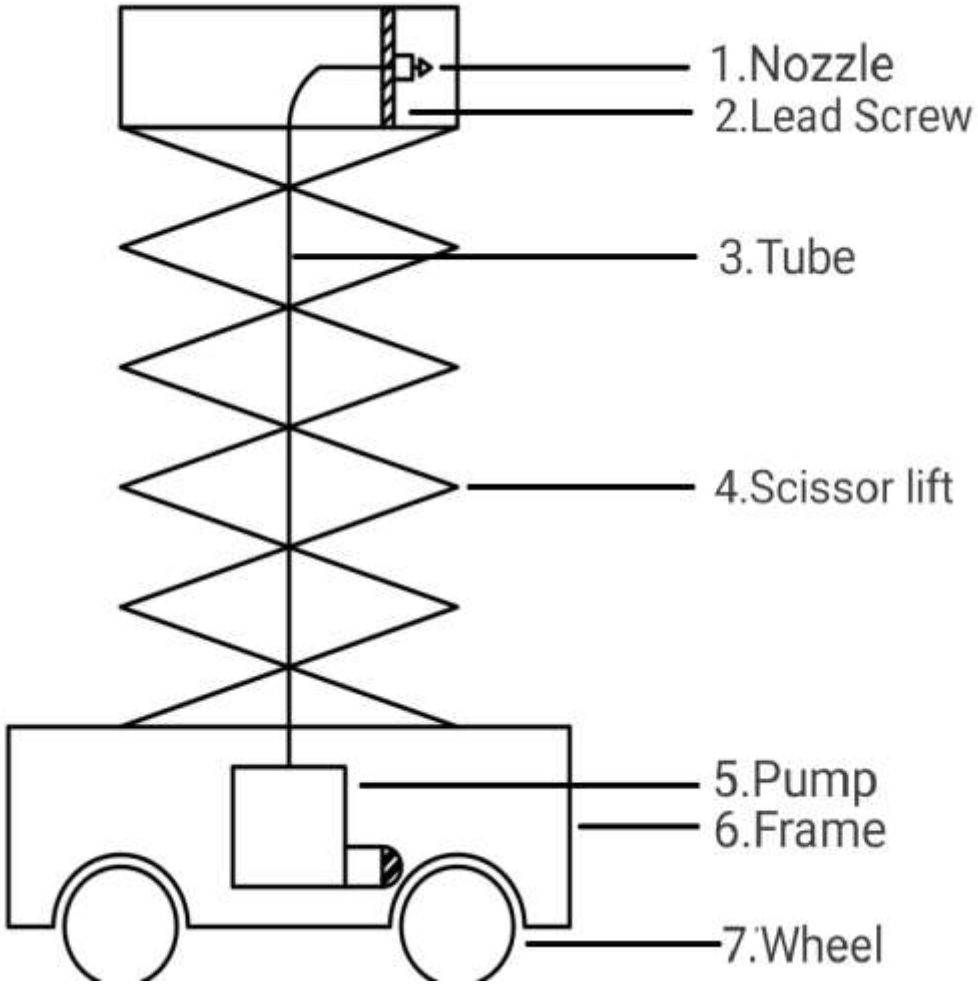

VI . Result

Thus from the project "Design and fabrication of ceiling painting" we observe that the motor allows the paint in the container to move up through the pipe to the nozzle which allows the paint to spray the ceiling

VII. Conclusion

As the conclusion of the project reduces the wastage of the paint and minimal uses of paint is required for perfect finishing on the ceiling.Work and time requirement for painting the ceiling is reduced when compared to manual process. The cost is very low when compared to other process.

VII.FUTURE SCOPE

Since India is among one of the developing countries it requires more man power and more time for painting the ceiling's. The growth of population and development of country requires new inventions to reduce the man power and time taken. The construction is among one of the well growing industries, which requires more labor and less time to finish the work. So the project helps them in painting the ceiling without the interference of human.

The use of automatic machine in major places is to reduce the risk of inhale toxic gases produced while painting.

It also reduces the risk of falling from certain height since the painting of ceiling requires skilled labor. So this project helps in the safety of labor full-fledged in the well growing industries.

The requirements of labor is still high these days but the workers are paid high wages due to requirement. The is only one-time investment and reduce the cost of painting drastically.

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