FABRICATION OF MANUALLY OPERATED SPRAY PAINTING MACHINE

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Abstract—Painting is a mode of creative expression, and the forms are numerous. Drawing, composition or abstraction and other aesthetics may serve to manifest the expressive and conceptual intention of the practitioner. Paintings can be naturalistic and representational (as in a still life or landscape painting), photographic, abstract, be loaded with narrative content, symbolism, emotion or be political in nature. To save the electricity we show our innovative topic, in which we use foot operated pump for building up the pressure up to 4 kg/cm² sq Pressure store in tank and utilized for spray painting machine.

Index Terms—HVLP, LVLP, Electrostatic spray painting

I. INTRODUCTION

Painting is the practice of applying paint, pigment, color or other medium to a surface (support base). The medium is commonly applied to the base with a brush but other implements, such as knives, sponges, and airbrushes, can be used. In art, the term painting describes both the act and the result of the action. However, painting is also used outside of art as a common trade among craftsmen and builders. Paintings may have for their support such surfaces as walls, paper, canvas, wood, glass, lacquer, clay, leaf, copper or concrete, and may incorporate multiple other materials including sand, clay, paper, gold leaf as well as objects.

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I.1 Need of spray painting machine

In Process industries and robotics and other applications, technology have been utilize in several purpose to carry out operation of opening and closing. Out of this technology pneumatic technology is important one, in fast life where time is a first important factor; we need to utilize automation technology for future growth. Keeping this factors in mind it has been found that pneumatic technology can be deliberately used to have very effective and good result about his work and cost effectiveness.

By imagine lot of examples one example is that today we show various type of doors such as sliding, revolving, swing, folding etc., all of these examples utilize complicated mechanisms for closing or opening operations hence to overcome this, we can use simple technology to do the required work is one pneumatic technology.

II. TYPES OF SPRAY PAINTING

Air gun spraying:-
This process occurs when paint is applied to an object through the use of an air-pressurized spray gun. The air gun has a nozzle, paint basin, and air compressor. When the trigger is pressed the paint mixes with the compressed air stream and is released in a fine spray.

Types of nozzles and sprays:-
Due to a wide range of nozzle shapes and sizes, the consistency of the paint can be varied. The shape of the work piece and the desired paint consistency and pattern are important factors when choosing a nozzle. The three most common nozzles are the full cone, hollow cone, and flat stream. There are two types of air-gun spraying processes. In a manual operation
method the air-gun sprayer is held by a skilled operator, about 6 to 10 inches (15–25 cm) from the object, and moved back and forth over the surface, each stroke overlapping the previous to ensure a continuous coat. In an automatic process the gun head is attached to a mounting block and delivers the stream of paint from that position. The object being painted is usually placed on rollers or a turntable to ensure overall equal coverage of all sides.

HVLP (High Volume Low Pressure):-
This is similar to a conventional spray gun using a compressor to supply the air, but the spray gun itself requires a lower pressure (LP). A higher volume (HV) of air is used to aerosolize and propel the paint at lower air pressure. The result is a higher proportion of paint reaching the target surface with reduced overspray, materials consumption, and air pollution. A regulator is often required so that the air pressure from a conventional compressor can be lowered for the HVLP spray gun. Alternatively a turbine unit (commonly containing a vacuum cleaner derived motor) can be used to propel the air without the need for an air line.

A rule of thumb puts two thirds of the coating on the substrate and one third in the air. True HVLP guns use 8–20 cfm (13.6–34 m3/hr), and an industrial compressor with a minimum of 5 horsepower (3.7 kW) output is required. HVLP spray systems are used in the automotive, marine, architectural coating, furniture finishing, scenic painting and cosmetic industries.

LVLP (Low Volume Low Pressure):-
Like HVLP, these spray guns also operate at a lower pressure (LP), but they use a low volume (LV) of air when compared to conventional and HVLP equipment. This is a further effort at increasing the transfer efficiency (amount of coating that ends up on the target surface) of spray guns, while decreasing the amount of compressed air consumption.

Electrostatic spray painting:-
Electrostatic painting was first patented in the U.S. by Harold Ransburg in the late 1940s. Harold Ransburg founded Ransburg Electrostatic Equipment and discovered that electrostatic spray painting was an immediate success as manufacturers quickly perceived the substantial materials savings that could be achieved. In electrostatic spray painting or powder coating, the atomized particles are made to be electrically charged, thereby repelling each other and spreading themselves evenly as they exit the spray nozzle. The object being painted is charged oppositely or grounded. The paint is then attracted to the object giving a more even coat than wet spray painting, and also greatly increasing the percentage of paint that sticks to the object. This method also means that paint covers hard to reach areas. The whole may then be baked to properly attach the paint: the powder turns into a type of plastic. Car body panels and bike frames are two examples where electrostatic spray painting is often used. There are three main technologies for charging the fluid (liquid or powders):

Direct charging: An electrode is immersed in the paint supply reservoir or in the paint supply conduit.

Tribo charging: This uses the friction of the fluid which is forced through the barrel of the paint gun. It rubs against the side of the barrel and builds up an electrostatic charge.

Post-atomization charging: The atomized fluid comes into contact with an electrostatic field downstream of the nozzle. The electrostatic field may be created by electrostatic induction or corona, or by one or more electrodes (electrode ring, mesh or grid).

Rotational bell:-
With this method the paint is flung into the air by a spinning metal disc ("bell"). The metal disc also imparts an electrical charge to the coating particle.

Electric fan:-
There are a variety of hand-held paint sprayers that either combine the paint with air, or convert the paint to tiny droplets and accelerate these out of a nozzle.

Hot spray:-
By heating the full bodied paint to 60-80 deg C, it is possible to apply a thicker coat. Originally the paint was re-circulated, but this caused bodying up, the system was changed to direct heating on line. Hot spraying was also used with Airless and Electrostatic Airless to decrease bounce- back. Two pack materials usually had premix before tip systems using dual pumps.

Air assisted airless spray guns:-
These use air pressure and fluid pressure 300 to 3,000 pounds per square inch (2,100–21,000 KPa) to achieve atomization of the coating. This equipment
provides high transfer and increased application speed and is most often used with flat-line applications in factory finish shops. The fluid pressure is provided by an airless pump, which allows much heavier materials to be sprayed than is possible with an air spray gun. Compressed air is introduced into the spray from an airless tip (nozzle) to improve the fineness of atomization. Some electric airless sprayers are fitted with a compressor to allow the use of an air assisted airless gun in situations where portability is important.

Airless spray guns: -
These operate connected to a high pressure pump commonly found using 300 to 7,500 pounds per square inch (2,100–52,000 KPa) pressure to atomize the coating, using different tip sizes to achieve desired atomization and spray pattern size. This type of system is used by contract painters to paint heavy duty industrial, chemical and marine coatings and linings.
Advantages of airless spray are:
The coating penetrates better into pits and crevices.
A uniform thick coating is produced, reducing the number of coats required.
A very "wet" coating is applied, ensuring good adhesion and flow-out.
Most coatings can be sprayed with very little thinner added, thereby reducing drying time and decreasing the release of solvent into the environment.
Care must be used when operating, as airless spray guns can cause serious injury, such as injection injuries, due to the paint ejecting from the nozzle at high pressure.
Airless pumps can be powered by different types of motor: electric, compressed air (pneumatic) or hydraulic. Most have a paint pump (also called a lower) that is a double acting piston, in which the piston pumps the paint in both the down and the upstroke. Some airless pumps have a diaphragm instead of a piston, but both types have inlet and outlet valves.
Most electric powered airless pumps have an electric motor connected through a gear train to the paint piston pump. Pressure is achieved by stopping and starting the motor via a pressure sensor (also called a transducer); in more advanced units, this is done by digital control in which the speed of the motor varies with the demand and the difference from the pressure set-point, resulting in a very good pressure control. Some direct drive piston pumps are driven by a gasoline engine with pressure control via an electric clutch. In electric diaphragm pumps, the motor drives a hydraulic piston pump that transmits the oil displaced by the piston, to move the diaphragm.
Hydraulic and air-powered airless pumps have linear motors that require a hydraulic pump or an air compressor, which can be electric or gasoline powered, although an air compressor is usually diesel powered for mobile use or electric for fixed installations. Some airless units have the hydraulic pump and its motor, built onto the same chassis as the paint pump.
Hydraulic or air powered airless provide a more uniform pressure control since the paint piston moves at a constant speed except when it changes direction. In most direct drive piston pumps, the piston is crankshaft driven in which the piston will be constantly changing speed. The linear motors of hydraulic or compressed air drive pumps are more efficient in converting engine power to material power, than crankshaft driven units.
Automated linear spray systems: -
Vacuum coating: - Manufacturers who mass-produce wood products use automated spray systems, allowing them to paint materials at a very high rate with a minimum of personnel. Automated spray systems usually incorporate a paint-saving system which recovers paint not applied to the products. Commonly, linear spray systems are for products which are lying flat on a conveyor belt and then fed into a linear spray system, where automated spray guns are stationed above. When the material is directly below the guns, the guns begin to paint the material. Materials consist of lineal parts usually less than 12 inches (30 cm) wide, such as window frames, wood molding, baseboard, casing, trim stock and any other material that is simple in design. These machines are commonly used to apply stain, sealer, and lacquer. They can apply water- or solvent-based coatings. In recent years ultraviolet-cured coatings have become commonplace in profile finishing, and there are machines particularly suited to this type of coating.
Automated flat line spray systems: -
Wood finishing: - Mass produced material is loaded on a conveyor belt where it is fed into one of these
flat line machines. Flat line machines are designed to specifically paint material that is less than 4 inches (10 cm) thick and complex in shape, for example a kitchen cabinet door or drawer front. Spray guns are aligned above the material and the guns are in motion in order to hit all the grooves of the material. The guns can be moved in a cycle, circle, or can be moved back and forth in order to apply paint evenly across the material. Flat line systems are typically large and can paint doors, kitchen cabinets, and other plastic or wooden products.

Spray booth:-
A spray booth is a pressure controlled closed environment, used to paint vehicles in a body shop. To ensure the ideal working conditions (temperature, air flow and humidity), these environments are equipped with one or more groups of ventilation, consisting of one or more motors and one or more burners to heat the air blown. In order to assist in the removal of the over sprayed paint from the air and to provide efficient operation of the down-draft, water-washed paint spray booths utilize paint detackifying chemical agents

III. Specification of components

II I. Bicycle pump

A bicycle pump is a type of positive-displacement pump specifically designed for inflating bicycle tires. It has a connection or adapter for use with one or both of the two most common types of valves used on bicycles, Schrader or Presta. A third type of valve called the Woods valve exists, but tubes with these valves can be filled using a Presta pump.

Several basic types are available:
- Floor models or track pumps
- Frame mounted
- Compact or mini
- Foot operated
- Double action

In its most basic form, a bicycle pump functions via a hand-operated piston. During the up-stroke, this piston draws air through a one-way valve into the pump from the outside. During the down-stroke, the piston then displaces the air from the pump into the bicycle tire. Most floor pumps, also commonly called track pumps, have a built in pressure gauge to indicate tire pressure.

Reservoir:

It is act as storage for compressed air, vacuum and non-aggressive liquids. It is energy saving assembly of compressed air and vacuum. For compressed air / vacuum networks with fluctuating demand. For preventing frequent startup of the compressor system. To cover high demands short-term

As supplement to screw / piston compressors, rotary compressors or vacuum pumps.

Spray Painting Gun:
- Model: 162A1
- Color Box: 20PCS(56.5*35.5*40cm)18/16KGS
- Description: Type Of Feed: GRAVITY
- Air Consumption(100%)CFM: 12.5
- Nozzle Size: 1.5/1.8mm
- Cup Size: 600ml
- Fluid(water)Delivery: 160-230ml/min
- Weight: 0.38kgs, 0.84lbs
- Air Pressure: 50psi, 3.5kg/cm²
- Air Inlet: 1/4
Trolley: (Wheel Trolley)
With two caster wheel & handle for holding cylinder load and supplied with chain.

IV. ADVANTAGE
1. Air are easily available anywhere
2. No electricity required
3. System is simple
4. Unit is portable

V. APPLICATION
In this project we store compressed air which if useful for multipurpose such as for filling the air in tiers ,filling the air in balloon for cleaning and washing the vehicle

VI. OBJECTIVE
1) Implementation of the pneumatic technology.
2) Modified the existing mechanisms.
3) To make use of pneumatic system were working fluid is readily available.
4) To prepare and efficient and cost effective system

VII. CONCLUSION
Spray painting is a painting technique where a device sprays a coating (paint, ink, varnish, etc.) through the air onto a surface. The most common types employ compressed gas—usually air—to atomize and direct the paint particles. Spray guns evolved from airbrushes, and the two are usually distinguished by their size and the size of the spray pattern they produce. Airbrushes are hand-held and used instead of a brush for detailed work such as photo retouching, painting nails or fine art. Air gun spraying uses equipment that is generally larger. It is typically used for covering large surfaces with an even coating of liquid. Spray guns can be either automated or hand-held and have interchangeable heads to allow for different spray patterns. Single color aerosol paint cans are portable and easy to store.

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