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System Design of Airless Spray Painting Machine for Mass Production Using gear Pump.

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ABSTRACT:- This paper describes the application of airless spray painting using gear pump which we are trying to implement in the sponsor company where they were facing some problems regarding their current spray painting machine. The machine they have at their facility is a compressed air spray painting which involves a compressor, spray hose, spray gun etc. In that machine there are losses of paint, power, as well as that system is hazardous to human health. So in this paper we have reviewed all the parameters that are required to do the background study for this application. We have compared both air & airless spray painting. The background study shows that in the airless spray painting machine various losses are reduced in greater amount.

Keywords:- *Airless spray painting, compressor, gear pump.*

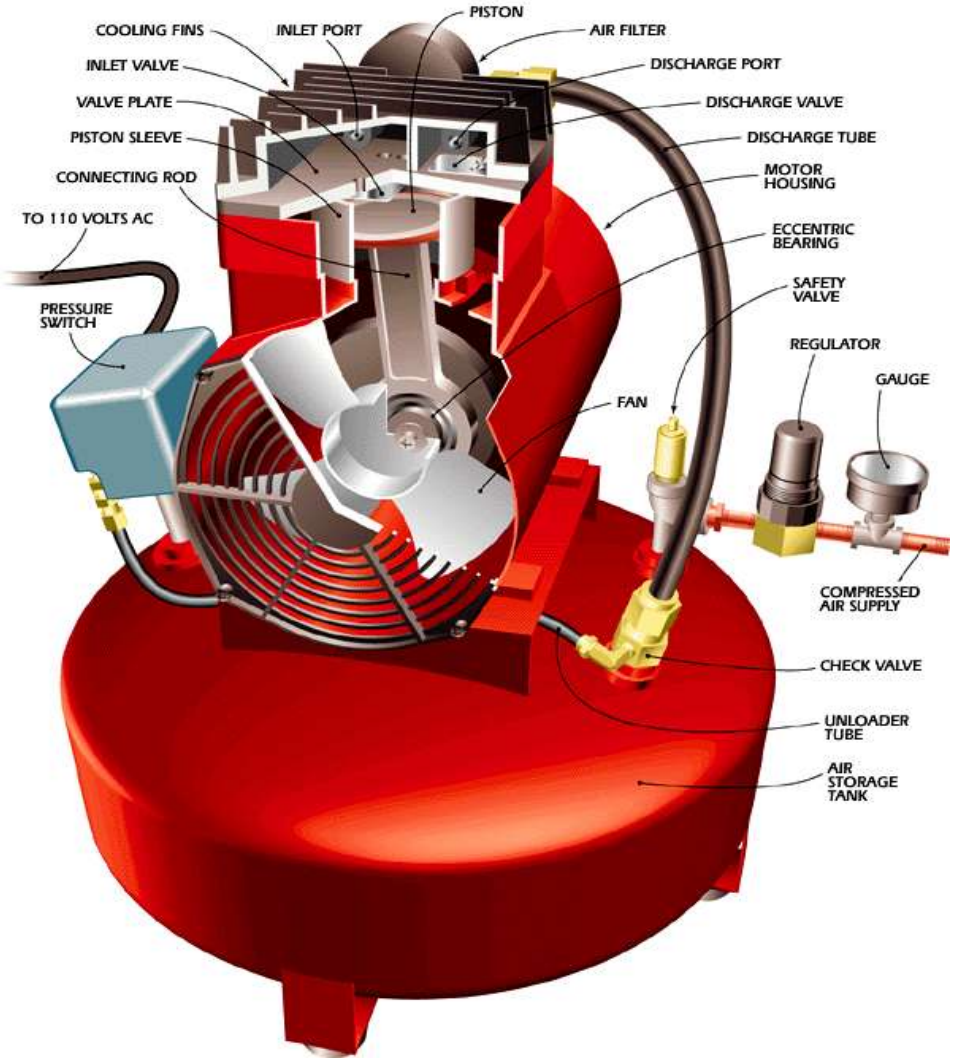
I. INTRODUCTION

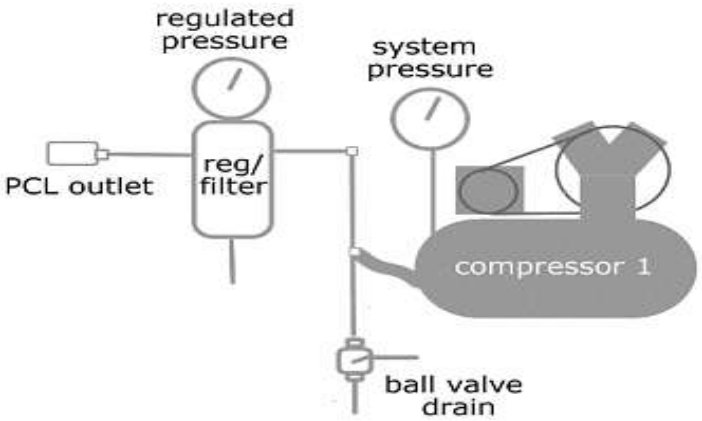
A spray painting machine is such kind of equipment which is being used/manufactured by most of the small scale industries for painting the objects being created by them. The conventional systems which are currently being used are having problems While dealing with the issue of mass production as in conventional system the tank used is of relatively small capacity which at a time can carry up to only 1/1.5 litre of paint (paint +thinner) this becomes a problem while going for mass production. Meanwhile with what we are trying to do is increasing the capacity of the tank up to a certain value with which we would not be needing to fill the tank more so often. The ideas of creating such equipment have various difficulties while manufacturing and designing. We are supposed to beovercoming whatever difficulty lies ahead us. In this review we have presented all the information leading to our objective of creating "spray painting with gear pump".

II. BACKGROUND STUDY

2.1COMPRESSED AIR SYSTEM:

In industry, compressed air is so widely used that it is often regarded as the fourth utility, after electricity, natural gas and water. However, compressed air is more expensive than the other three utilities when evaluated on a per unit energy delivered basis. Compressed air is typically one of the most expensive utilities in an industrial facility. While designing energy saving compressed air systems various methods are applied to reduce energy losses and minimize energy consumption.The compressed air systems require the complex approach towards rational energy consumption by effective production, distribution and application equipment of the compressed air. As a first step towards identifying applicable energy savings an inventory of compressed air system and major system operating parameters should be established. On the basis of the data collected, the basic indicators of compressed air system performance can be calculated or estimated: specific power, annual energy cost, cost of compressed air, compressedair leaks, pressure drop in a system.Pressure drop is proportional to the square of the velocity. Any high-volume, intermittent demand produces dramatic pressure drop during Peak periods.[1]





2.2 GEAR PUMP:

2.2.1 Flushable rotary gear pump:-

In a flushable rotary gear pump author used valve structure for use with rotary gear pump, which selectively establishes a bypass channel between an inlet to and an outlet from the pump to enable large volume flow of flushing media between pump inlet and outlet and across the pump gears, thereby to facilitate flushing of the pump and supply and delivery lines. Advantage of this invention is that colourchange takes place very quickly and easily. There is no need for establishing separate spray station for each colour or to even spray long

sequence of articles of same colour as both methods are not practically desirable. In a computerised spray machine, author used a computer to set controls values for painting according to the paint so that it's easy for a machine to quickly and easily adjust for new paint as each paint has its own characteristics. Earlier these values were set manually which was taking much time for changing these parameters. These parameters are control for drives which controls horizontal and vertical movement of spray gun as well as speed of the gun. Other variables of the spray machine capable of being set include the number of passes of the gun (related to paint fan spray pattern of the gun), the flash period after each coat (to allow solvent evaporation), the width of the spray stroke and the number of coats of paint.

Another aspect of this invention is use of gear pump.Gear pump is used in place of pressure vessel. The advantage of a gear pump is that it pumps accurate volumes of paint and is not subjected to delays in response to a change of paint flow as is the pneumatic pressure system.[10]

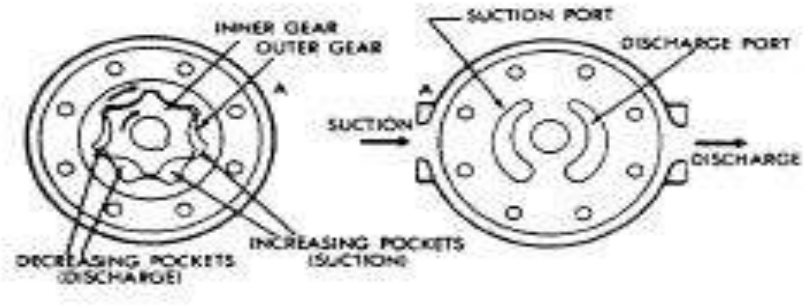


Figure 4-5.—Centered internal gear pump.

2.2.2METHOD AND DEVICE FOR FEEDING A CONTROLLED VOLUME FLOW OF LIQUID TO A SPRAY NOZZLE-:

In this paper, author used a device for controlling volume flow of liquid to spray nozzle for automatic spray application. A conduit defines a flow path from a liquid source to the spray nozzle. For highly precise flow volume of paint gear pump is used for this application as it is most preferred for precise control of volume flow. [12]

2.**3 PAINTING**:

It should be noted that 10 different paint groups, including 54 paint systems are indicated for a number of applications (paint schedule). Therefore, the user should decide which paint system is to be used at the design stage or at the start of a project.

The basic principles of corrosion prevention by paints and the characteristics of some paint systems are discussed here. In addition, the text introduces typical painting systems for storage tanks, refinery, fresh water vessels, and ships.

The potential life of a protective system is unlikely to be realized unless

• The correct choice of system is made

• The materials used in the system can be supplied when required and with the properties attributed to them when making the choice

• The materials are applied in conditions and with widely accepted standards

• The handling, transportation, and storage (over which the main contractor has minimal control) of all materials and coated components results in no damage to the integrity of the materials or coating that cannot be completely restored

• The erection procedures cause no damage to the coatings that cannot be completely restored

• Such restoration of damaged areas results in a protection at least as good as that of the undamaged areas

There are many variables (both natural and otherwise) that can influence the fulfilment of all these conditions for success. It follows that no two projects can be exactly alike, and this is one reason why a standard specification should always be included in the set of contract documents. [4]

2.3. PREPARING METAL FOR PAINTING:

Most paints do not adhere well and blister in a humid atmosphere if applied to an alkaline or neutral surface. For best painting results, the surface pH should be slightly acid. The best results occur when the surface has a pH between 3 and 5. There are exceptions when using special paints, such as inorganic zincs, which

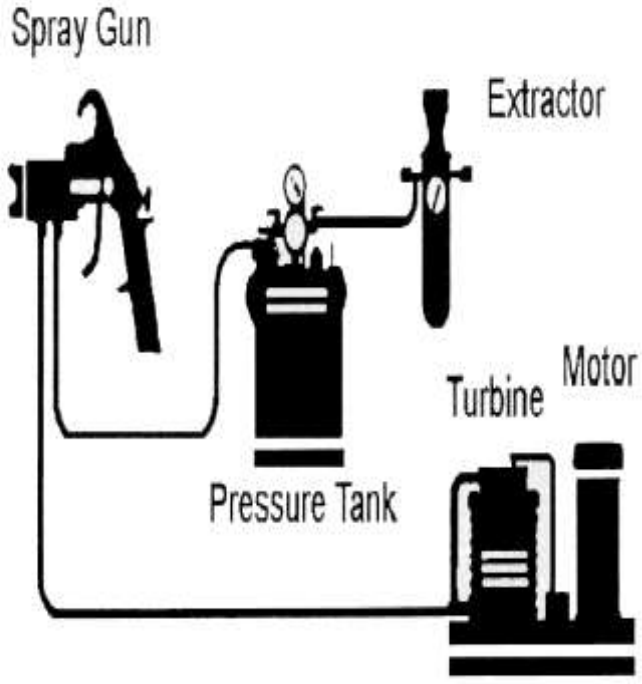
normally are applied to neutral surfaces. In pickling processes for inorganic zinc applications, no further treatment is normally used after the hot-water rinse.

For paints other than those containing inorganic zincs, it is important that theproper pH be maintained. Phosphoric or chromic acids, or mixtures of the two, produce the best results. Muriatic or sulphuric acids should not be used because their residues stimulate the formation of rust under paint.

It is desirable to further clean and treat pickled and rinsed steel in a phosphoric acid solution prior to painting. Good results can be obtained by adding approximately 0.25% by weight of concentrated phosphoric acid to the hot-rinse bath in a steel tank, and maintaining this rinse at a pH of 3 to 5 by continuing to add acid as needed.

The cleanliness of the boiling rinse is important because this is where a satisfactorily cleaned surface can be spoiled for painting. For best results, the bath should be discarded and the tank cleaned daily. This is not practical for large-scale structural pickling operations, however, and good painting results can be obtained by merely maintaining a water rinse temperature at 60°C or higher and painting promptly while steel is warm and dry.[5]

Figure 5. HVLP System (VT DEC)



III. FUTURE SCOPE

- The system we are currently trying to design is a mechanical system in which there is no atomization involved, so we can do certain things automatic such as level indicator.
- We can do compartments in the system for using various paints simultaneously.
- We can implement 'Robotized Control' in functioning of this system.
- Position and direction sensors can be used.
- For small object painting requiring high pressure, instead of huge tank a small atomized mechanismcontaining various paints can be used for painting.

IV. CONCLUSION

Thus the study of paints, compressed system, and gear pump is done and accordingly the presentation is done. The review paper is been done in IEEE format and literaturereview memberis also been completed. The system trial has been taken which was successful after long trials and the purpose was achieved. According to the problem definition of project of solving uncertainties in the system, the problem was solved. Thus the survey

for purchasing the system components was done in various markets relating to plumbing systems. The knowledge was gained by each team of the project and thus system trial was taken.

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