International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 03 | Mar 2019 www.irjet.net p-ISSN: 2395-0072

Pneumatic Conveyer with Bottle Filling and Placing Machine

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Abstract - *A "Pneumatic Conveyer with Bottle Filling and Placing" is a material conveying design to transport the material from one place to another place with the feature of bottle filling and placing. The pneumatic transport is a common operation frequently employed to transport solid particles from one location to another. Pneumatic transport of solids is widely used due to many of its advantages.*

In industry the conventional conveyers that use belt and chain are normally operated using electric motor. The need of system is conveyance that can give intermittent as well as continuous mode of operation will have fast response as well. Above problem can be solved by using pneumatic system.

The system run by compressed air which is above atmospheric pressure to move material through movement of mechanical devices used as transport equipment in pneumatic system.

The system can be used in emergency when electricity is not available and its environment friendly as well using air as fliud. The material and maintenance cost is low. The capacity can be increased. Its save to operate and do not required any skilled operator.

Key Words: Design in AutoCAD-2013, Transmission system.

1. INTRODUCTION

In the present age of increasing demand in productivity the packaging process is also being automated by automation techniques. In packaging automation technique one needs an appropriate filling and conveyance system which will do the following functions,
A. Conveyance of container from one station to other at variable speed.

B. Accurate positioning of container at given station

C. Automatic filling.

D. Synchronous conveyance and filler operation

In order to fulfil the above requirements the system must incorporate the following functions:

The conveyance of job can be done by mounting it on this conveyor belt, for the above process is needed to have the following features:

1. Conveyor should operate at different operating speeds to accommodate any given filling process.

2. The Conveyor should have an auto stop after every cycle of filling operation.

3. The conveyor should be able index any given length in horizontal plane to accommodate any phase of staggered filling.

4. The conveyor should have an inching facility to continue after the first stage stop, to carry out the multiple containers filling.

5. The conveyor should be universal to accommodate any given size of container in given specifications.

2. PNEUMATIC SYSTEM

The word pneumatic come from the Greek word 'pneuma' means 'air' or 'wind'. Tool and appliance driven by compressed air are known as pneumatic devices. In some cases, air suction instead of compression is used to operate the tool or appliance, as in the vacuum cleaner. Example of these devices are pneumatic –conveyors, rock – drills, Jackhammers, spray and airbrakes.

2.1 Types of Pneumatic System

2.1.1 Positive pressure system:

Positive pressure dilute phase pneumatic conveyors are typically employed to convey bulk material from a single source to one or multiple destination, over longer distance and with greater capacity than possible using vacuum system.

2.1.2 Vacuum system:

Vacuum dilute phase pneumatic conveying system are generally employed for transporting material from multiple sources as storage vessels, process equipment, trucks and rail cars, to individual or multiple destinations. Unlike positive pressure systems, vacuum system allow easy pick-up of materials from open containers using wands, and do not impart heat to the material. Since vacuum systems offer superior leak containment, they are often specified on the basis of cleanliness, particularly when handling hazardous materials.

3. TRANSMISSION SYSTEM

The mechanical power produced by prime mover. I used to drive various machines in the workshop and factories. A transmission system is the mechanism, which deals with transmission of the power and motion from prime mover to

shaft or from one shaft to the other. The machine tool drive is an aggregate of mechanism that transmits motion from an external source. To the operative elements of the machine tool. The external source of energy is generally a three phase A.C. motor, which has a rotary motion at its output shaft.

3.2 Types of Transmission System

Mechanical Transmission and its elements: -

1) Belt Transmission

2) Gear Transmission

3) Chain Transmission

4. CONSTRUCTION

4.1 Motor

Motor is an Single phase AC motor, Power 120 watt, Speed is continuously variable from 0 to 6000 rpm. The speed of motor is varied by means of an electronic speed variator. Motor is an commutator motor i.e., the current to motor is supplied to motor by means of carbon brushes.

4.3 Control valve

Figure -actual 5/2 DCV

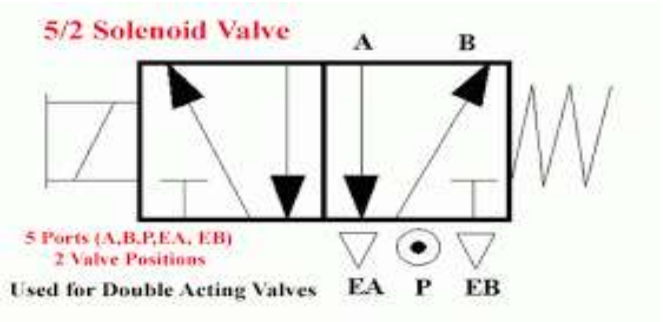

Figure 4 1 schematic 5/2 DCV

To control the to and fro motion of a pneumatic cylinder, the air energy has to be regulated, controlled, and reversed with a predetermined sequence in a pneumatic system. Similarly one has to control the quantity of pressure and flow rate to generate desired level of force and speed of actuation. To achieve these functions, valves are used to-(i) start and stop pneumatic energy, (ii)control the direction of flow of compressed air, (iii)control the flow rate of the compressed air and (iv) control the pressure rating of the compressed air.

A direction control valve has two or three working positions generally.

1) Neutral or zero position
2) Working position

4.4 PIPING

The function of the piping in either a hydraulic or a pneumatic system is to act as a leak. Proof carrier of the fluid.

4.4.1 PIPE MATERIAL

Steel pipes are normally used for air mains. For braid pipes or smaller lines up to about 25 mm. Bore copper piping nylon tubing is commonly employed with flexible lines at the take-off points. Flexible nylon tubes may be used directly for smaller diameter house or reinforced with braid for larger.

Rubber house is used for flexible lines where a wide working temperature is required or larger size is needed. Plain (uncomforted) polythene tubing is more flexible than nylon tubing. Typical maximum pressure rating 7 bars for 15 mm O.D. tubing is not for rigid installations except where adequate support by pipe clips can be arranged.

Piping may be divided three classes:

1) Rigid 2) Semi rigid 3) Flexible

Figure 4 2 air pipes

4.5 AIR LINES:

The efficiency of any pneumatic system fed through pipelines depends very largely on the pipe size adopted. Pipes, which are too small, will choke the how, resulting in excessive pressure drop is directly proportional to length. Pressure drop figures, in fact are commonly quoted in terms of pressure drop per unit length. Pipe lengths, however is relatively insignificant as a design control parameter compared with pipe bore size, since pressure drop is inversely proportional to (bore) 5 approximately in other worlds, a small change in bore size can have a marked effect on pressure drop. Whereas even doubling the pipe length will only result in doubling the pressure drop.

4.6 BEARING:

A bearing is a machine element which supports another moving. It permits a relative motion between the contact surfaces of the members, while carrying a load. It supports the shaft as the axel and holds it in correct position with respect to frame and casting.

TYPES OF BEARING:-

1) Ball bearing

2) Roller bearing

Figure 4 3 Ball Bearing

4.7 Gear:

Modern gears are a refinement of the wheel and axle. Gear wheels have projections called teeth that are designed to intersect the teeth of another gear. When gear teeth fit together or interlock in this manner they are said to be in mesh. Gears in mesh are capable of transmitting force and motion alternately from one gear to another. The gear transmitting the force or motion is called the drive gear and the gear connected to the drive gear is called the driven gear.

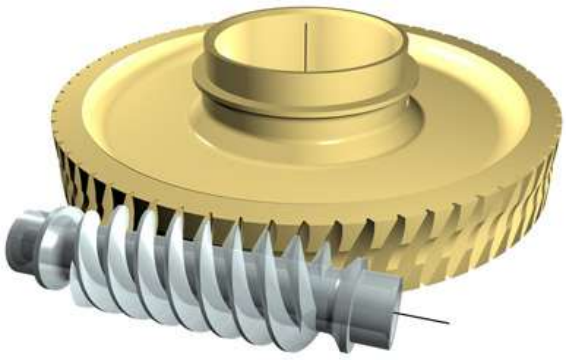

Figure 4 4 worm and worm gear

Figure 4 5 spur gear

4.8 Belt Drive

The power from the motor is supplied to the input shaft of the mechanism by means of an open belt drive. The drive comprises of the motor pulley mounted on the motor shaft, the belt FZ 6x 500, and reduction pulley mounted on the input shaft.

5. WORKING

The Pneumatic Conveyor can be operated in Dual mode

5.1 Complete Conveyance Mode

The job to be transferred is placed on the conveyor roller bars and considering the process and transfer speed the speed flow control valve is adjusted to give desired surface speed. The Air connection is started by actuating the electric power supply to the electronic circuit. Air motor is started to run the worm gear reduction arrangement that drives the chain sprockets and thereby the roller chain to transfer the job from one station to another in continuous fashion.

Here the auto filler arrangement is void or kept close.

5.2 Staggered Conveyance mode With Auto Filling

The container to be filled is placed on the conveyor belt and considering the process and transfer speed the speed flow control valve is adjusted to give desired surface speed .The belt carry indexer buttons as per no of stops and position of the same. Conveyor is indexed to the first stop position.

At the first stop the belt motion stops and the filler valve is opened for the time set in timer , after the desired fill time, the valve is closed and the inching switch is triggered.

Now inching switch is operated to bypass the first station stop ie, the proximity sensor, the inching switch operated the relay to actuate the 5/2 way DC valve which open the air connection to operate the air motor and there by the conveyor system starts to move, now when the second indexer button comes in front of the proximity switch the relay de-activates to stop the 5/2 way valve and thereby the air motor, thus job is accurately positioned at the second station.

Procedure mentioned above is repeated to carry out the given function.

The position of the indexer buttons is defined by the length of travel desired.

6. DESIGN

Design consists of application of scientific principles, technical information and imagination for development of new or improvised machine or mechanism to perform a specific function with maximum economy & efficiency.

Hence a careful design approach has to be adopted. The total design work, has been split up into two parts

- System design
- Mechanical Design.

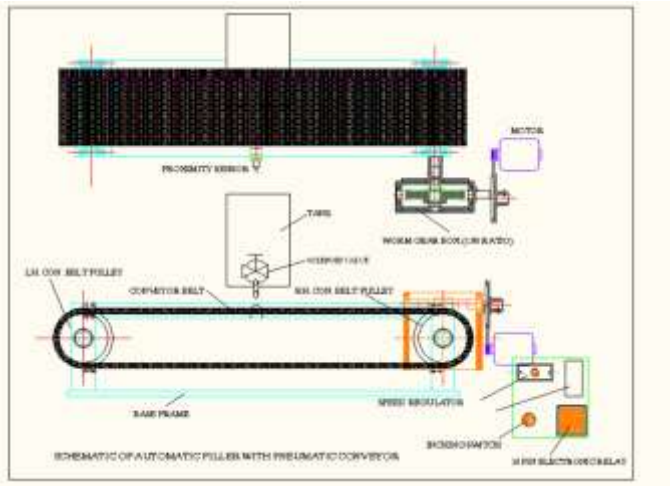

Fig -1: Name of the figure

7. CONCLUSIONS

Although the design criterions imposed challenging problems which, however were overcome by us due to availability of good reference books. The selection of choice raw materials helped us in machining of the various components to very close tolerance and thereby minimizing the level of wear and tear.

Needless to emphasis here that we had lift no stone unturned in our potential efforts during machining, fabrication and assembly work of the project model to our entire satisfaction.

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BIOGRAPHIES

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4. P S G DESIGN DATA