

PNEUMATIC AUTO FEED DRILLING MACHINE

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Abstract - In small-scale industries and automobile maintenance retailers, there are frequent wants of drilling, boring, and grinding. Vast and sophisticated designed elements cannot be machined with the assistance of a standard machine and any for each operation separate machine is needed so increasing the amount of machines needed and increasing the world needed for them to be accommodated and thence overall initial price needed. In our project the higher than difficult issues are reduced. The most objective of our project is to perform varied machining operations victimization "Auto feed mechanism" in drilling machine with the assistance of pneumatic sources. During a single machine all the higher than specified operation are often administered, i.e., once drilling, the drill head is aloof from the barrel key and therefore the needed tools like grinding wheels, boring tool etc., are often connected, and therefore the operation are often performed. By the applying of pneumatics, the pneumatic cylinder with piston that is operated by air compressor can provide the serial action to work this machine. By this we will attain our industrial necessities.

Key Words: Auto feed mechanism, Pneumatic sources, Drill head, Barrel key, Pneumatic cylinder, Air compressor

1. INTRODUCTION

The main objective of our project is to perform varied machining operations victimization "Auto feed mechanism" in drilling machine with the assistance of gas sources. For a developing trade the operation performed and therefore the elements (or) elements made ought to have it minimum doable cost for it to run profitableness. In small-scale industries and automobile maintenance outlets, there are frequent wants of modification and loosening of screws, drilling, boring, grinding, reaming, tape recording and broaching machine.

Huge and sophisticated designed elements cannot be machined with the assistance of a standard machine and any for each operation separate machine is needed thus increasing the amount of machines needed and increasing the world needed for them to be accommodated and thence overall initial value needed. In our project the on top of sophisticated issues are decreased. By the appliance of mechanics, the gas cylinder with piston that is operated by associate degree compressor can provide the serial action to work this machine. By this we will succeed our industrial needs.

1.1 PRINCIPLE OF PNEUMATICS

The word mechanics is that the study of air movement. The laws of physics dictate that uncontained gases can fill any given house. The best thanks to see this in action is to inflate a balloon. The elastic skin of the balloon holds the air tightly within, however the instant you utilize a pin to make a hole within the balloon's surface, the air expands outward with most energy that the balloon explodes. Compression a gas into a little house may be a thanks to store energy. Once the gas expands once more, that energy is discharged to try to do work. That is the principle behind mechanics.

1.2 OBJECTIVES OF PNEUMATICS

Automation will be achieved through computers, hydraulics, pneumatics, robotics, etc., of those sources, mechanics type a pretty medium for low price automation. The most advantage of a gas system is that it's economical and easy in construction that makes it totally different from alternative sources of automation. Automation plays a crucial role in production. These days the majority the producing method is dynamic to machine-driven machines so as to deliver the merchandise with higher quality and at a quicker rate. The producing operation is being machine-driven for the subsequent reasons.

- To succeed production
- To cut back man power
- To increase the potency of the plant
- To cut back the work load
- To cut back the assembly value and time
- To cut back the fabric handling
- To cut back fatigue of staff
- Less Maintenance

2. LITERATURE REVIEW

2.1 AUTO INDEXING GEAR CUTTING ATTACHMENT FOR SHAPING MACHINE

M.V.N Srujan Manohar, S.Hari Krishna, University College of engineering, JNTU, A.P, INDIA {2012}:

They have been investigated to use pneumatic shaper for high production of automatic gear cutting with auto indexing work piece. A small ratchet gear structure has been thus devised to demonstrate the gear cutting attachment in shaping machines. The

pneumatic source of power with control accessories is used to drive the ram or the cylinder piston to obtain the forward and return strokes.

By this arrangement the forward/reverse stroke of the pneumatic cylinder is adjustable type when compared with the conventional machines. We desired a shaping machine which will automatically index the job and gives automatic tool feed to the pneumatic cylinder

2.2 DESIGN & FABRICATION OF PNEUMATICALLY OPERATED PLASTIC INJECTION MOULDING MACHINE

Poonam G. Shukla, Gaurav, P. Shukla Nagpur, India {2013):

This project intends to use of plastic is inflated currently days in several industries like automobile, packaging, medical, etc. the rationale behind this is often that the plastic created things are quiet easier to manufacture, handle and reliable to use that the plastic merchandise producing industries are pains arduous to provide smart quality merchandise at giant scale and cheaper price

The hydraulically operated machines solve the matter, however they're too costlier for tiny scale and medium scale industries. This paper deals with style and fabrication of pneumatically operated injection plastic moulding machine. The operated by hand machine is regenerate into pneumatically operated machine by applying correct style procedure.

2.3 DESIGN AND DEVELOPMENT OF SEMI-AUTOMATIC CUTTING MACHINE FOR YOUNG COCONUTS

Satip Rattanapaskorn' Kiattisak Roonprasang' King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand (2008):

The purpose of this analysis is to style, fabricate, test, and value the model of a semi-automatic young coconut fruit cutting machine. The look conception is that fruit cutting is accomplished by gas go on a young coconut sitting on a pointy knife during a vertical plane. The machine consists of five main parts: 1) machine frame, 2) cutting base, 3) knife set, 4) gas system, and 5) tanks receiving coconut juice and cut fruits.

The machine elements contacting edible elements of the fruit square measure made from food grade chrome steel. Operating, a young coconut is placed on the cutting base and therefore the gas management is switched on. The coconut is mechanically moved to

the pressing unit and cut in half by a knife set. The coconut juice flows right down to the tank whereas the cut fruits square measure separated and moved into the opposite tank

3. DESCRIPTION OF EQUIPMENTS

3.1 DOUBLE ACTING CYLINDER

A double acting cylinder is utilized on top of things systems with the total pneumatic artifact and it's essential once the cylinder itself is needed to retard serious hundreds. This will solely be done at the top positions of the piston stock. All told intermediate positions a separate outwardly mounted artifact device should be given the damping feature.

The normal escape of air is out off by a padding piston before the top of the stock is needed. As a result the site within the padding chamber is once more compressed since it cannot escape however slowly per the setting created on reverses. The air freely enters the cylinder and therefore the piston stokes within the different direction at full force and speed.



Fig -1: Double acting cylinder

3.2 RECIPROCATING COMPRESSORS

Pneumatic systems operate a provider of compressed gas that should be offered in sufficient amount and at a pressure to suit the capability of the system. When the gas system is being adopted for the primary time, but it'll so be necessary to manage the section of compressed gas provide.

The key a part of any gas machine is provide of compressed gas is by suggests that reciprocal mechanical device. A mechanical device could be a machine that takes in air, gas at a definite pressure and delivers the air at a high. Designed for either stationary (or) transportable service the reciprocal mechanical device is out and away the foremost common sort.

Reciprocating compressors deliver over five hundred m³/min. In single stage mechanical device, even though the gas pressure is of 6 bar, the machines will discharge pressure of fifteen bars. Discharge pressure within vary of 250 bars is obtained with high reciprocal compressors that of 3 & four stages.



Fig -2: Reciprocating Compressors

3.3 5/2 WAY SOLENOID VALVE

Commonly referred to as DCV, this valve is employed to manage the direction of air flow within the gas system. The directional valve will this by dynamic the position of its internal movable elements. A magnet is associate degree device that converts current into line motion and force. The assorted elements of magnet valve and their operating area unit mentioned below.

The magnet valve has five openings. This ensures straightforward exhausting of 5/2 valve. The spool of the 5/2 valve slide within the most bore in line with spool position; the ports get connected and disconnected. The working rule is as follows

Position-1: once the spool is motivated towards outer direction port 'P' gets connected to 'B' and 'S' remains closed whereas 'A' gets connected to 'R'

Position-2: once the spool is pushed within the inner direction port 'P' and 'A' gets connected to every different and 'B' to 'S' whereas port 'R' remains shut

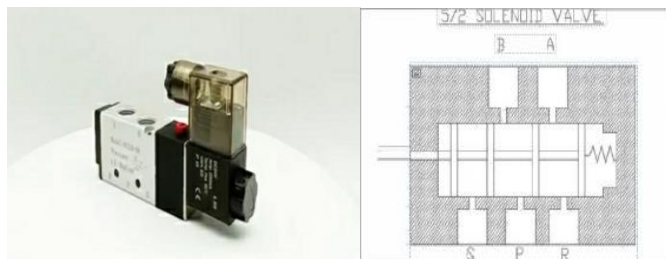


Fig -3: 5/2 way solenoid valve

3.4 PNEUMATIC MOTOR

It is a pneumatic motor which runs by supplying by compressed air, for performing any operation the

pneumatic motor, when compressed air impinges on rotor of the motor it rotates and the barrel which was connected to rotor is rotated, there by various operations are performed by changing various tool bits from the barrel. With its industrial grade 3/8" chuck, this economical choice includes high quality features for general drilling and hole sawing jobs. The planetary gear reduction balances the load on bearings and gears for increased tool life.



Fig -4: Pneumatic Motor

3.5 CONTROL UNIT (SEQUENCE TIMER)

Timing control unit (sequence timer) is connected to solenoid valve to control the time required for changing the workpiece by supplying electric current to change the valve direction. When timing control unit is switched on, electric current is supplied to solenoid valve which in turn drilling operation takes place as it supplies air for piston downward motion and pneumatic motor.

When the timing control unit is switched off, electric current is not supplied to the solenoid valve and drilling operation does not takes place as valve direction is changed and now air is supplied for piston upward motion and drill head moves up (i.e. air stops supplying to pneumatic motor and piston downward motion). Also we can set the sequence time for drilling next workpiece automatically if we can change the workpiece in a constant time.

4. SPECIFICATIONS OF COMPONENTS AND DESIGN CALCULATIONS

Table -1: Double acting Cylinder

Stroke length	140 mm = 14 cm
Piston diameter	40 mm
Piston rod	10 mm
Quantity	1
Seals	Nitride (Buna-N) elastometer
End cones piston	Cast iron EN-8
Media	Air
Temperature	0 - 70 C

Table -2: 5/2 way solenoid valve

Size	0.635 X 10 ⁻² m
Port size	G 0.635 x 10 ⁻² m
Max pressure range	0-8 bar

Table -3: Flow control valve

Port size	0.635 x 10 ⁻² m
Pressure	0-10 bar
Media	Air

Table -4: Hose connectors

Max working pressure	10 bar
Temperature	0-80 C
Fluid media	Air
Material	Brass
Diameter	06 mm
Locking	Self-locking

Table -5: Hoses

Max pressure	8 bar
Outer diameter	8 mm = 8 x 10 ⁻³ m
Inner diameter	3 mm = 3 x 10 ⁻³ m
Material	Poly urathene

Table -6: Barrel Unit

Short capacity	0.635 X 10 ⁻² m
Barrel inner diameter (ID)	30 mm = 30 x 10 ⁻³ m
Drill capacity	1.5-10 mm

Table -7: Foundation

Basement depth	1 ft
Length of beam	4 ft
Breadth of beam	2 ft
Height of the beam	2.5 ft

Table -8: Design calculations

Maximum pressure applied in the cylinder(P)	8 bar
Area of cylinder (A)	$(\pi/4) \times (D^2)$
Force exerted in the piston (F)	Pressure applied x area of cylinder
Force extraction (FE)	$(\pi/4) \times (D^2) \times P = (\pi/4) \times (5^2) \times 8 = 157 \text{ N} = 16 \text{ Kg}$
Force retraction (FR)	$(\pi/4) \times (D^2 - d^2) \times P = (\pi/4) \times (5^2 - 1.5^2) \times 8 = 143 \text{ N} = 14.5 \text{ kg}$
Consumption of air in extraction (CE)	$(\pi/4) \times (D^2) \times (P + 1) \times L / 1000 = (\pi/4) \times (5^2) \times (8 + 1) \times 16 / 1000 = 2.82 \text{ lt/min}$
Consumption of air in retraction (CR)	$(\pi/4) \times (D^2 - d^2) \times (P + 1) \times L / 1000 = (\pi/4) \times (5^2 - 1.5^2) \times 9 \times 16 / 1000 = 2.57 \text{ lt/min}$

4.5 FABRICATION

The stand (or) base carries the total machine. the total machine is put in on the muse .A circular column having length of 90cm concerning one third half of} its length is within the foundation the remains part is on top of the muse, from the higher finish of the vertical column 50cm is machined by playacting turning operation, a bush with having length seven.5cm is machined and slides over the machining elements of rod.

The horizontal rod is slider over the, vertical column by means that of bush. A double acting cylinder is connected to horizontal column by mistreatment clamp for feeding of the machine. A gas motor with chuck is connected to the horizontal column commonly. A 5/2 means coil worth is connected to manage the double acting cylinder to upward & downward motion. One acting cylinder and a movable jaw is fastened to the bottom of the machine it'll act as a piece device.

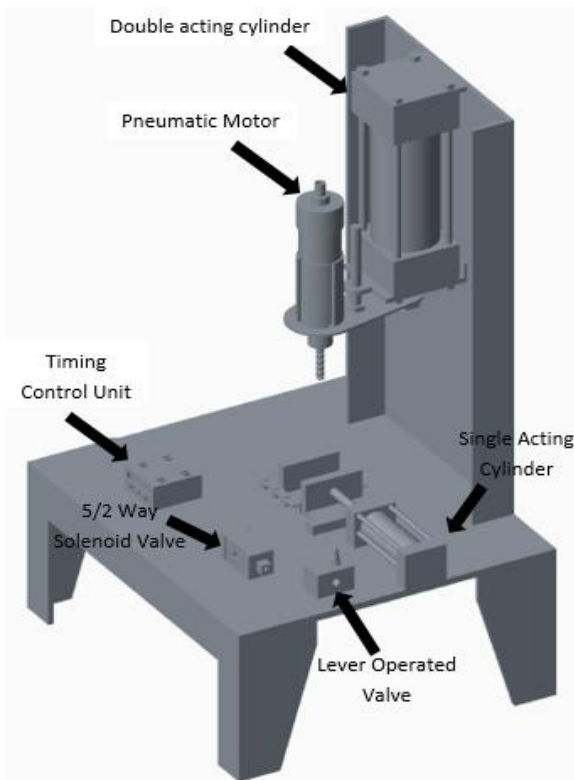


Fig -6: Pneumatic auto feed drilling machine – Photographs

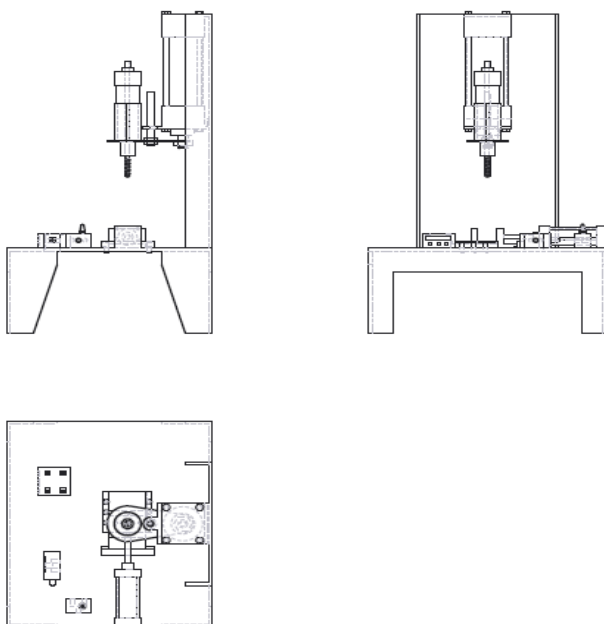


Fig -5: Pneumatic auto feed drilling machine isometric and orthogonal views of 3d model

6. WORKING

The compressed gas from the mechanical device is employed because the force medium for this operation. Air motor and double acting cylinder is employed during this machine. The air from the mechanical device enters the coil valve. From the coil valve, air enters into the gas motor and double acting cylinder's piston downward motion port (connected through hose connectors) through means a method (a technique - a way) and also the different way of air enters to the double acting cylinder's piston upward motion port. A vice is fastened to the bottom of the machine which can act as a piece device.

Once air enters the piston downward motion port because of pressure distinction the drilling head comes down and at a similar time air enters the gas motor (with chuck containing tool bit) and drills (rotates) the work piece. Flow management valve is provided to each gas motor and double acting cylinder to regulate the speed (motor rpm) and feed (up and down motion) severally.

Temporal order management unit (sequence timer) is connected to coil valve to regulate the time needed for dynamic the work by provision current to vary the valve direction. once temporal order management unit is switched on, current is provided to coil valve that successively drilling operation takes place because it provides air for piston downward motion and air motor.

When the temporal arrangement management unit is changed, current isn't provided to the coil valve and drilling operation doesn't takes place as valve direction is

modified and currently air is provided for piston upward motion and drill head moves up (i.e. air stops provision to gas motor and piston downward motion). Additionally we will set the sequence time for drilling next work mechanically if we will modification the work in a very constant time.

7. ADVANTAGES

- It reduces manual work and quick in operation.
- Accuracy is more and occupies less space.
- Low cost machine and easy maintenance.
- Consumption of electric power is less when compared to manual machines.
- In a single machine many operations are performed like drilling, tapping, reaming, grinding by just changing the tool bit.

8. APPLICATIONS

- Used in automobile workshops for drilling mechanical device holes.
- Used in tiny scale industries.
- For playing the operations in large numbers that cannot be tired standard machines, since it's transportable.
- In attachment buy grinding.
- In such places wherever frequent amendment operative is needed.

9. CONCLUSIONS

The project allotted by us created associate impressing task within the field of tiny scale industries and automobile maintenance outlets. It's terribly usefully for the staff to hold out variety of operations in an exceedingly single machine. Automation is attainable for big scale industries however not for little scale industries therefore we have a tendency to adopt low price automation and medium of effort is additionally is freely on the market.

This project has additionally reduced the price concerned within the concern. Project has been designed to perform the whole demand task that has additionally been provided. This project work has provided us a wonderful chance and skill, to use our restricted information. We have a tendency to gained heaps of sensible information relating to, planning, purchasing, collecting and machining whereas doing this project work. We have a tendency to feel that the project work could be a sensible resolution to bridge the gates between the establishment and therefore the industries

We square measure proud that we've completed the work with the limited time with success. PNEUMATIC AUTOFEED DRILLING MACHINE is functioning with

satisfactory conditions. Ready to} able to perceive the difficulties in maintaining the tolerances and conjointly the standard. We've done to our ability and ability creating most use of accessible facilities.

9.1 FUTURE SCOPE

Further study is to be done to enhance the performance parameters like output and potency. The subsequent modifications are to be drained this machine in future, they are

- Tool ever-changing additionally to be done mechanically by victimization decide and place automaton
- By ever-changing the work device we will perform radial drilling operation
- By constrain the tool bit move we will perform shaping operation
- Gear cutting is additionally attainable by ever-changing the work device.

REFERENCES

- [1] M.V.N. srujan manohar and S. Hari Krishna "Auto indexing gear cutting attachment for shaping machine" (2012)
- [2] Poonam G, Shukla, gaurav and P. Shukla "Design & fabrication of pneumatically operated plastic injection moulding machine" (2013)
- [3] Satip Rattanapaskorn' Kiattisak roonprasang "Design and development of semi-automatic cutting machine for young coconuts" (2008)
- [4] A.S. Aditya polapragada and K. Sri Varsha "Pneumatic auto feed punching and riveting machine" (2012)
- [5] R.H. WARRNING "Pneumatic hand book"
- [6] Festo catalogues