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Pneumatic Quick Self Centering Clamp

Chaitanya Nevewani[1], Siddhanth Kamble[2], Keyu Shah[3], Aniket Shelar[4]

[1-4]*Department of Mechanical Engineering, MGM College of Engineering and Technology, Kamothe*

Abstract - *In current situation, with globalized market, Enterprises are deprived to create items with lower costs and furthermore they are deprived to give quality segments. Subsequently they are deprived to decrease the assembling costs via mechanizing more modest works which builds the lead time and arrangement time. This examination work manages calculated demonstrating and manufacture of four machine toss which is utilized to hold the round and hollow parts solidly during machining. Atomization is accomplished through pneumatic force utilizing packed air. Rather than utilizing toss keys to fix the jaws of four jaw toss here we use pneumatic power through twofold acting chambers to hold the work piece immovably. Solenoid valves are utilized to direct and control the twofold acting chambers to change the jaws of throw to be pushed ahead or in reverse ways. This Exploration significantly accentuation in decrease of arrangement time and furthermore helps in wellbeing of administrator by holding the work immovably against high velocity machining activities.*

1.INTRODUCTION

A fixture is a special purpose tool which is used to facilitate production(machining, assembling, and inspection operations). Fixtures provide a means of manufacturing interchangeable parts since they eliminate the necessity of a special setup for each individual part. Fixture is bolted or clamped to the machine table. It is usually heavy in construction. To fulfil the basic function a fixture should possess the following components:

• A sufficiently rigid body into which the work pieces are loaded.

• Locating elements.

• Clamping elements.

• Elements for positioning or fastening the fixture on the machine which it is used.

According to the degree of mechanization fixtures are classified :-

- Hand operated
- Power operated
- Semi-automatic
- Automatic

1.1 CLAMPING :

Purpose of clamping is to exert a pressure to press the work piece against the locating surface and hold it during the manufacturing operations.

Some guiding principles for clamping system are:

- Clamping pressure must only hold the work piece and should never be enough to damage, deform or change any dimensions of work piece.
- Clamping should be simple and quick.
- Clamp should be designed to deliver the required clamping force when operated by smallest force expected.
- Clamping pressure should be directly towards the point of support otherwise will tend to rise from its support.

1.2 ASSEMBLY FIXTURES :

Assembly fixtures are used to hold various components in their correct position while they are assembled. Particularly when various parts are to be put together for welding. They are simple & effective means to assure higher productivity & convenient performance of assembling operations, securing quick & accurate fixturing of mating parts during assembly.

2. OBJECTIVES :

1. Design, development and analysis of auto feed drill head with sensor based depth control.

2. Design, development and analysis of hydraulically actuated self-centering fixture.

3. Testing of drilling mechanism with self-centering fixture in order to determine:

- Reduction in cycle time of fixturing.
- Improvement of dimensional accuracy due to implementation of fixture.
- Productivity improvement owing to use of developed system.

- Analysis of clamping force in self-centering fixture at different hydraulic oil pressure. his work is planned to be completed in following phases.

3. LITERATURE REVIEW :

• Study of various configurations of Auto drill head, methods of self-centering fixture etc , will be studied using various Handbooks, United State Patent documents. Technical papers, etc.

• Normally the work piece is centered by operator by just seeing it in eye. It is a difficult task to be done; it can be only done by an experienced operator. It has grooves on it in order to assemble the work piece at center. Setup time will get increased by this manual work. By setting a dial indicator against the work piece will helps to reduce the time for setting and also it will make the exact center of work. Dial indicator will have a magnetic base in order to fix with the machine bed. Jaws of Chucks are individually tightened by the operator with help of a chuck key made up of iron. Write down the high reading and the low reading from the indicator.

• Calculate the average reading of the dial indicator by adding the high reading to the low reading and then dividing by two.

Average = (High Reading + Low Reading)/2

• Adjust the jaw that is aligned with the dial indicator plunger and the opposite jaw so the indicator reads zero. Indicator plunger may be aligned with jaw of chuck by rotating the chuck to 90 degrees. Adjust the jaw that is aligned with the dial indicator plunger and the opposite jaw so the indicator reads zero.

4. DESIGN :

Design consists of application of scientific principles, technical information and imagination for development of new or improvised machine or mechanical system to perform specific functions with maximum economy and efficiency. Hence a careful design approach has been adopted. The total design work has been split up into two parts :

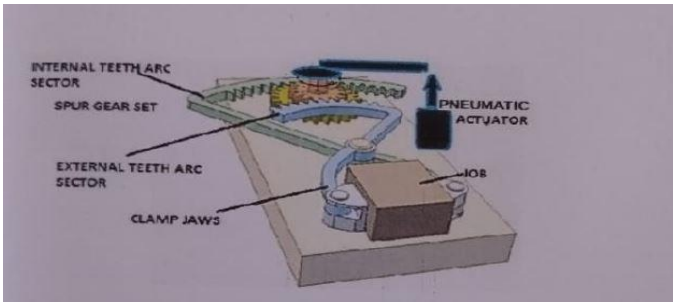

Fig -1: Proposed layout of pneumatic self centering clamp

4.1. System design :

- System design mainly concerns with various physical constraints space requirement arrangement of various components etc.
- The mechanical design has direct norms with system design hence system is designed such that distinctions obtained after mechanical design can be well fitted into it.
- System selection is based on physical constraints.
- It reduces weight of machine system.
- Ease of maintenance and servicing is achieved by means of simplified layout that enables quick disassembly of components. And it provides scope for future improvement .

4.2. Mechanical design :

- In mechanical design the components are listed down and stored on the basis of their procurement design in two categories namely,
  - I. Designed parts.
  - II. Parts to be purchased.
- For designed parts, detailed design is done and distinctions thus obtained are compared to next highest dimensions which is readily available in market.
- This simplifies the assembly as well as post production and servicing work. The various tolerances on the work are specified.

Fig -2: manufactured pneumatic self centering clamp

5. WORKING PRINCIPLE :

An air compressor is a device used to maintain and storing pressurized air inside a cylindrical tank which converts power into potential energy.

By one of several available methods, an air compressor tends to forces more and more pressure of air into a storage tank tends to increase the pressure. Compressor will get cut off automatically when tank pressure reaches the upper limit. The compressed air will withstand inside the compressor until it is used. Kinetic energy of air inside the compressor is then released and tank depressurizes. Whenever the compressor tank reaches the lower limit compressor turns on automatically and repressurizes. Compressed air inside the tank is then transferred to a solenoid valve. A solenoid valve is used to control to open valve and close the valve. The pressure of the air is controlled by the pressure gauge. When the solenoid valve is opened the compressed air is passed to the double acting cylinder through hose. In a double acting cylinder, air pressure is applied alternately to the relative surface of the piston, producing a propelling force and a retracting force. Working area of the piston is relatively smaller and the thrust produced during retraction will be smaller. The impeccable tubes of double acting cylinders are usually made of steel. The working surfaces are also polished and coated with chromium to reduce friction. By using the double acting cylinder we can control or adjust the jaws for holding the work piece. After the operations are done in lathe machine, the material is removed from the jaws by closing the solenoid valve so that the flow of compressed air is stopped and the piston retracts to its original position.

5.1. How to use the precision clamping system :

1. Keep the clamp on the plain surface.

2. Open the clamp to fit the job.

3. Put the two work pieces in the clamp and tight the clamp and tight the clamp sightly.

4. Level the other ends of the work pieces.

5. Open the 5/2 valve.

6. Cylinder operates to operate the lever.

7. Lever moves the clamp system to clamp job.

8. Adapt the same procedure for the next joint.

9. For the production use two or four clamps at a time.

5.2. WORKING COMPONENTS :

• BASE PLATE :

It is a plate that serves as a base or support. Base plates are usually used to distribute column loads over a large enough area of supporting concrete construction that the design bearing strength of the concrete is not exceeded.

• FIXED LOACATOR :

Fixed or solid supports are easier to use. This is used when a machined surface acts as locating point. It is simple and cheap.

• SHAFT (main and secondary) :

A shaft is a rotating machine element which is used to transmit power from one place to another. The power is delivered to the shaft by some tangential force i.e. twisting moment. The line of shafting that receives its power directly from the engine or motor transmits power to other parts.

• PINION :

When meshing pair of gears, the smaller gear is called a pinion gear. Also, it refers to the cylindrical gear that meshes with a rack in a rack-and-pinion mechanism which transforms rotational motion to linear motion.

• GEAR :

A gear is a rotating circular machine part having cut teeth or, which mesh with another toothed part to transmit torque. A gear may also be known informally as a cog. Geared devices can change the speed, torque, and direction of a power source.

• LH RH arm :

Many mechanical arms are used for very ordinary things like being able to grab an out of reach object with the pincer mechanical arm. A simple system of 3 joints squeezes and releases motion causing the pincer to close and finally grab a desired object.

• LEVER :

Many lever switches use either a flat lever, toggle switch, or handle that must simply be moved back and forth to turn the switch on or off. When the switch is activated, electrical contact points inside of the switch touch together and the circuit is closed, allowing electricity to flow.

• PNEUMATIC CYLINDER 5/2 VALVE :

5/2 way is a five port, two position valve that will put a fluid or air into one end of a double acting device as well as allowing the other end vent to exhaust. Normally closed

(N.C.) means that when the solenoid valve is not energized the supply pressure port is closed off.

5.2.1 SELECTION OF PNEUMATIC CYLINDER FOR STROKE :

Y – Axis translation

Standard cylinder (14167) , DNU 25-50-PPV-A

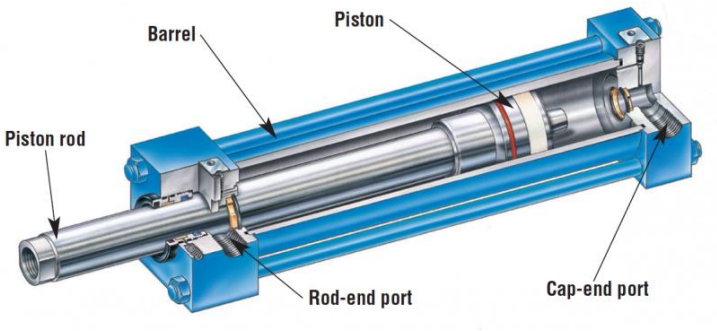

Fig -1: Name of the figure

Table -1: Specifications of

Standard cylinder(14167) DNU-25-50-PPV-A

Operating medium	Dried compressed air
Corrosion resistance	2
Ambient temperature	20C, 80C
Authorization	Germanischer Lloyd
Cushioning length	30 mm
Theoretical force at 5 bar, return stroke	180 N
Theoretical force at 5 bar, advance stroke	240 N
Additional weight per 10 mm stroke	76 g
Basic weight for 0 mm stroke	76 g
Mounting type	With accessories
Pneumatic connection	
Material information for cover	Aluminum
Material information for piston rod	High alloy steel
Material information for cylinder barrel	Anodized

6. FUTURE SCOPE :

Anticipating the eventual fate of the pneumatics business :

The English public economy has been strikingly steady throughout the previous ten years, which is a finished change on the 'win and fail' pattern of earlier many years.

Growth has been a few percent each year and most financial markers have been positive.

Effect on pneumatics :

There have been two prevailing issues for us to consider. The first is regular to numerous enterprises: producing has relocated to low wage economies in Asia. This relates both to our own industry and to our clients' ventures.

The second, while not exactly novel to liquid force, relates especially to the exactness production of innovative merchandise, like designing segments and subsystems.

Savvy Pneumatics :

CRITERION	FEATURE
Stoke	50
Piston diameter	25
Piston rod thread	M10
Cushioning	Pneumatic cushioning adjustable at both ends
Assembly position	Any
Conforms to standard	ISO 6431
Piston rod end	Male thread
Design structure	Piston
Position detection	With proximity sensor
Variants	Single ended piston rod
Operating pressure	0.3-12 bar
Mode of operating	Double-acting

With tactile data streaming in the two ways, old pneumatic cycles are being changed into shrewd pneumatic frameworks, with information imparted to more elevated level regulators and disseminated to neighborhood networks.51

Adjusting request :

Most producing organizations had no real option except to diminish their in house designing capacities through the 1990s and depend increasingly more on acquired aptitude.

I would foresee an expanding reliance on such organizations, and note that their industry is developing, solidifying and globalizing in a way that recommends that they are here as long as possible.

Lower Vacation, Lower Expenses :

Five years prior, a web study detailed that prescient support could diminish costs by as much as 30%, with a comparing decrease of gear vacation of up to 70%.

Exploration of Pneumatics :

Research projects are likewise in progress, consolidating the mastery of industry pioneers and scholastics to foster new sorts of sensor innovation. This exploration is taking a gander at cutting edge electronic information assortment frameworks.

A information will alter the manner in which producers work and keep up pneumatic hardware, empowering nonstop change and calibrating because of nitty gritty tactile input.

7. CONCLUSION S:

Our Project Pneumatic Self centering fixture, was designed and fabricated bearing in mind its use in small scale industries, so we adopted and choose all the channels that reduced the overall cost. Therefore the fixture fabricated by us can well meet the economic demand and multiple tasks of small scale industries due to its low initial cost.

Current scenario in Manufacturing Industries greatly emphasis on automation in order to reduce the set up time and also to reduce the manufacturing costs incurred during the operation. This Research had attained a step towards automation by fabricating a four jaw Machine chucks operated through pneumatic.

Pneumatic chuck helps the operator to mount the work piece easily within a short span of period and it also ensures the safety to operator as tightening the jaws of chuck is automatically done with help of pneumatic power rather than tightening manually.

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