Auto Indexing Gear Cutting Attachment for Shaping Machine

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Abstract—A shaper is used to machine a single job by using a single point cutting tool and hence it cannot be used for high production rates. This project intends 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.

Key words: Gear Cutting, Nylon Gears

I. INTRODUCTION

This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

Degrees of automation are of two types, viz.

- Full automation.
- Semi automation.

II. METHODOLOGY

The compressed air is used as the working medium, normally at a pressure of 6-8bars (also can be extended up to 15bar) and a maximum force up to 50KN can be obtained. Pneumatics is used extensively in industry as well as in many everyday applications. It has many distinct advantages in terms of energy consumption, cost and safety. Pneumatic power is used in industry, where factory machines are commonly plumbed for compressed air (other compressed inert gases can also be used). Pneumatics also has applications in dentistry, construction, mining, and other areas.
III. WORKING OF GEAR CUTTING MACHINE

Initially starting with air compresses, its function is to compress air from a low inlet pressure (usually atmospheric) to a higher pressure level. This is an accomplished by reducing the volume of the air.

Air compressors are generally positive displacement units and are either of the reciprocating piston type or the rotary screw or rotary vane types. The air compressor used here is a typically small sized, two-stage compressor unit. It also consists of a compressed air tank, electric rotor and pulley drive, pressure controls and instruments for quick hook up and use.

The 5/2 solenoid valve is controlled by the electronic timing control unit. The speed of the on/off the solenoid valve is controlled by this timing control unit. The 2 outlet ports are connected to an actuator (Cylinder). The pneumatic activates is a double acting, single rod cylinder. The cylinder output is coupled to further purpose. The piston end has an air horning effect to prevent sudden thrust at extreme ends.

The compressed air goes to the solenoid valve through flow control valve. The flow control valve is used to control the amount air flow to the cylinder. This flow is adjusted by manually by the nap is fixed above the flow control valve. Then this air goes to the 5/2 solenoid valve.

![Fig. 2: Working Gear Cutting Machine](image)

IV. RACK AND PINION

A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack"; rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion.

![Fig. 3: Rack And Pinion](image)

For example, in a rack railway, the rotation of a pinion mounted on a locomotive or a railcar engages a rack between the rails and forces a train up a steep slope.

For every pair of conjugate involute profile, there is a basic rack. This basic rack is the profile of the conjugate gear of infinite pitch radius. (i.e. a toothed straight edge.) A generating rack is a rack outline used to indicate tooth details and dimensions for the design of a generating tool, such as a hob or a gear shaper cutter.

V. GEAR TYPES

Straight teeth have the tooth axis parallel to the axis of rotation. Straight teeth that run parallel to the axis of the gear. Load movement or transfer is manual or walk-behind.

![Fig. 4: Straight Teeth](image)
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Helical teeth gears provide continuous engagement along the tooth length and are often quieter and more efficient than straight tooth gears. Helical tooth gears resemble spur gears in the plane of rotation.

![Fig. 5: Helical Teeth](image)

Roller pinion drives use bearing supported rollers that mesh with the teeth of that rack in order to provide minimal to no backlash.

VI. PERFORMANCE SPECIFICATIONS

The speed with which the rack moves as the pinion turns is determined by the diameter of the gear.

![Fig. 6: Rack And Pinion Movement](image)

\[ \frac{v_{\text{rack}}}{v_{\text{pinion}}} = \frac{1}{r_{\text{pinion}}} \]

VII. CONCLUSION

In the gear cutting attachment for shaping machine variable speeds can be obtained by adjusting the timer device and pressure of the compressed air. Since the mechanism is so simple and versatile it can be handled by any operator, constriction of the unit is very simple. Handling the machine is easy and smooth operation is achieved.

VIII. FUTURE SCOPE

The following modifications are also to be done in this machine in future.

They are

1) Tool changing also be done automatically by using pick and place Robot.
2) So many No. Of operations can be performed in a same machine.
3) This Multipurpose machine can be modified into universal machine.
4) Gear cutting is also possible by changing the work holding device.

REFERENCES