

Design and Fabrication of Slotting Attachment Drilling Machine

M. Ganesh¹ B. Prasanth² S. Rajamohan³ V. Thirumaran⁴ G. S. Molly Irine⁵

^{1,2,3,4,5}Department of Mechanical Engineering

^{1,2,3,4,5}IFET College of Engineering, Villupuram, Tamilnadu, India

Abstract— Slotting attachment drilling machine is nothing but one of the Lifting system in automobile at the time of emergency. In this Lifting system pneumatically operated one. Here the additional pneumatic cylinder and Control Valve is provided in the automobile itself. In this project, the Control Valve is used to activate/deactivate the Air input. The Valve is 'ON' at the time of emergency; the compressed air goes to the pneumatic cylinder. Then the compressed air passes through the tube, and then pushes the pneumatic cylinder, so that the Lifting is applied at the time of Valve in "ON" position (i.e.-Emergency time). The speed of the pneumatic cylinder is varied by using flow control valve. This is the way of controlling Lifting speed of the Trailer at the time of emergency. In our project, we have to apply this Pneumatic Modern Trailer Mechanism in Load Lifting Vehicles.

Key words: Drilling Machine, Pillar Drill, Gear Pairs

I. INTRODUCTION

Drilling machine is one of the most important machine tools in a workshop. It was designed to produce a cylindrical hole of required diameter and depth on metal work pieces. Though holes can be made by different machine tools in a shop, drilling machine is designed specifically to perform the operation of drilling and similar operations. Drilling can be done easily at a low cost in a shorter period of time in a drilling machine. Drilling can be called as the operation of producing a cylindrical hole of required diameter and depth by removing metal by the rotating edges of a drill. The cutting tool known as drill is fitted into the spindle of the drilling machine. A mark of indentation is made at the required location with a centre punch. The rotating drill is pressed at the location and is fed into the work. The hole can be made up to required depth.

II. DRILLING CONSTRUCTION

The basic parts of a drilling machine are a base, column, drill head and spindle. The base made of cast iron may rest on a bench, pedestal or floor depending upon the design. Larger and heavy duty machines are grounded on the floor. The column is mounted vertically upon the base. It is accurately machined and the table can be moved up and down on it. The drill spindle, an electric motor and the mechanism meant for driving the spindle at different speeds are mounted on the top of the column. Power is transmitted from the electric motor to the spindle?

A. Drill Slotter

A drill slotter is an invention, which gives an inexpensive attachment for a drilling machine where by simple slotting or other similar operations may be performed thus obviating the necessity of having an entirely separate and expensive machine for this purpose. It provides a very substantial and rugged design which is adapted to provide a wide range of speeds. It is suitable for various types

of work, and can be manufactured and sold at a very small price than ordinarily charged for the actual machines used for the same work. It is claimed to be so light in weight such that it can be readily lifted on to or off the drill table. It can also be secured in place or detached in a very few minutes. The device can be used to make all kinds of jobs that are ordinarily done by a large slotter machines.

B. Slotter Attachment

A slotting attachment is one that can take up small slotting jobs by attaching itself to a drilling machine.

The main features of this attachment are:

- It can be readily fixed into an already existing drilling machine
- It can be easily fixed on to and removed from the drilling machine
- It is very economical when compared to the other

C. Multioperations

The history of antimatter begins in 1928 with a young This machine can perform three operations drilling, slotting and shaping, in a single machine. This concept reduces the work time and save the cost of machining. Here, instead of using a slotting machine and a shaping machine, special arrangements are made in the drilling machine for slotting operation and shaping operation to be carried out By using this machine, the investment cost for slotting and shaping machines in the industries can be minimized. The multi process, machine can be operated by attaching the drilling machine with the bevel gear and cam mechanism arrangements. The bevel gear is used for perpendicular power transmission from the motor by connecting to the drill chuck, to the shaft which is connected to a cam arrangement on the other side. The cam arrangement converts rotary motion into reciprocating motion and the reciprocating motion is used for the slotting and shaping operation. The slotting tool and shaping tool are guided by a horizontal guide bush. The work table is mounted on a hydraulic bottle jack piston rod hence when the bottle jack handle is pumped the table height can be adjusted according to the requirement when the after the process is completed the pressure should be released through the pressure relief valve to make the table come down. The table is mounted with a vice to hold the work piece. Dividing table, a precision work positioning.



Fig. 1: Pillar Drill

device which enables the operator to drill or cut work at exact intervals around a fixed axis and enable regular work positioning at divisions for which indexing plates are not necessary. The main components used in the design of the attachment constitute of a worm gear [1] which is attached to the main shaft that rotates with the drill spindle, which is in turn attached to a socket that is chucked with the drill spindle. This worm gear is paired with a spur gear which is locked with a horizontal shaft. Thus the horizontal crank shaft rotates, as the gear pair gets into motion when the drill spindle rotates.

Figure 2 illustrates the gearpairs.

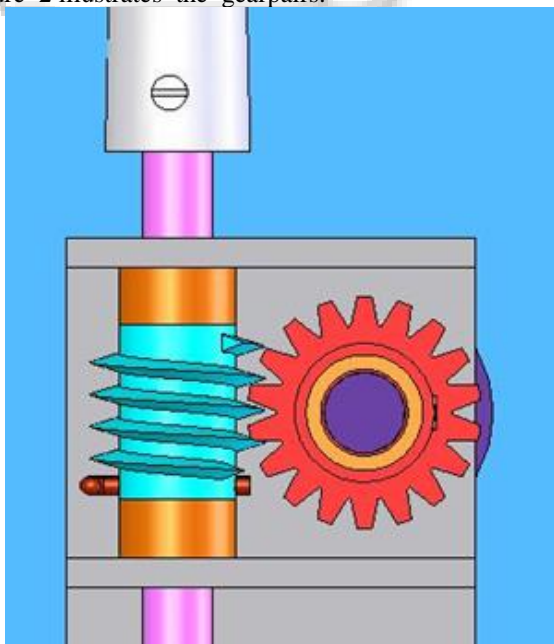


Fig. 2: Gear Pairs

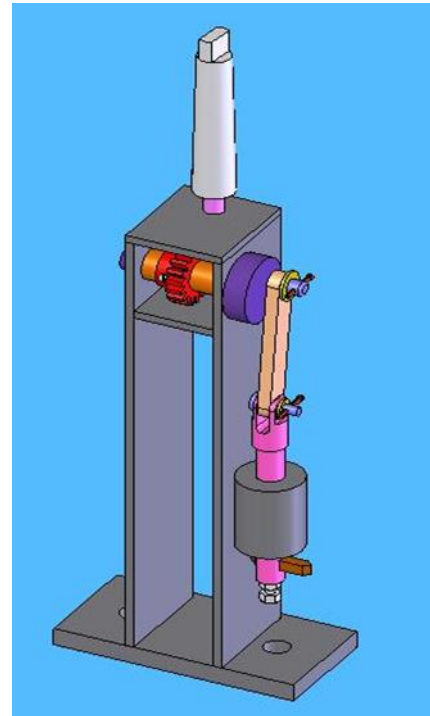


Fig. 3: Attachment

The major component in this attachment is bevel gear. The bevel pinion is attach on the vertical shaft. On the one end of the shaft Morse taper (MT2) is machined. This Morse taper is perfectly fitted into the drilling spindle. The horizontal and vertical shaft is connected by suitable bevel gear arrangement whose module is 3.5 mm. The diameter of the bevel gear is 210 mm and bevel pinion is 105 mm. In this we are using crank and slotted quick return mechanism. The crank diameter is 165 mm and its mounted on the horizontal shaft one end. Length of stroke can be easily adjusting by moving the connecting pin in the slots of the crank. The slotted arm is pivoted on one end of the gear box frame. Connecting link is directly attach with the slotted arm and link up with the dovetail guideways. The cutting tool is perfectly position in the tool holder which is rigidly fixed on the dovetail guide ways. The work is clamp on the work holding device and longitudinal and transverse motion is given to the work by means of the compound slide. Compound slide maximum travel distance is 250 mm in the both direction. When the spindle rotates the shaft receives the drive and transmit it to the sleeve. the other end of the sleeve is connected to the main shaft which is made up of mild steel 15 mm shaft. The bewel gear and cam mechanism is used to transfer rotary motion into reciprocating motion.

We are performing the operation on pillar drill and radial drill machine. An available space in the pillar drill machine is 1100 mm and in radial drill is 2000 mm. height of the attachment is 1000 mm. by the rack & pinion mechanism we are adjusting the height of the attachment according to the drill space available. This attachment is directly fitted in to the drilling spindle. The spindle rotates at the speed of 100 rpm so the vertical shaft rotate at the speed of 100 rpm, here the gear ratio of the bevel gear is 2, so the crank (rotor) and horizontal shaft is rotates with 50rpm. now connecting pin fixed on crank.

It has rotary as well as sliding motion in the slotted arm. so slotted arm gets oscillating motion. Connecting link is attach with slotted arm and the dove tail guideways. Due to the connecting link oscillating motion converted into the reciprocating motion. so cutting tool is reciprocating.



Fig. 4: Drill Machine



Fig. 5: The slotting attachment in working

D. The main features are:

It consists of very simple parts for transmitting the motion of the drill spindle to the slotting tool, thus reducing the complex nature of the attachment.

- Unlike the multi process machine and the drill slotter mentioned above, this design avoids the bevel gears which decreases the complexity of the design. This also reduces slippage of the mating gears.
- The cost of this product is very low when compared to any other means of producing square holes or slots. The fabricated slotter attachment in working condition at a small scale industry where a drilling

When this unit was completed and tested using an Upright Drilling Machine vibrations were experienced due to the radial play of the internal parts. Thus the square could not be machined with that much accuracy. Thus to overcome this defect a thin walled cylindrical hollow sleeve has been introduced between the casing and sleeve. The cylindrical sleeve and the internal parts have very less clearance just to allow them to rotate and no radial play. Thus the vibrations have been arrested. The material used of the sleeve is Mild Steel. This drilling machine attachment shall be utilised for other purposes other than machining form holes. This unit eliminates the presence of slotting machine in machine shop. Of course it may not be useful for all the jobs that a slotter can perform. This is because of lack of rigidity that a slotter has. But for small job works like machining a keyway etc can be very well performed by using a suitable tool bit fixed in the tool holder using a bar. Now moreover by giving a very high RPM and minimum feed the frequency of reciprocation can be increased. When this high frequency reciprocation are applied on the job through an abrasive slurry, a hammering effect takes place on the work piece and any complicated shape in the tool can be produced in the job as a female part of the tool. The abrasive slurry consists of mixture of water and abrasive particles. This slurry and work piece is enclosed in a container

This attachment can be thought of an inversion of the “Cam and Ball mechanism. This attachment can be fitted either in drilling machine or vertical milling machine. A complete design for this attachment for a size of maximum 20mm square and polygon holes has been successfully done and tested using an upright drilling machine. For different sizes of holes less than 20mm the tool can be changed. Similar designs can be made for any size and any number of sides to avoid lot of setting time and pre-machining procedures involved in current methods and very useful in case of mass production.

E. Advantages

- The accuracy of shape.
- Comparatively less labour cost than other methods.
- Less physical and mental fatigue.
- Bolts and nuts can be easily seated.
- Machining time is less.

F. Disadvantages

- Not so effective for very hard materials.
- Feed should be given intermittently.
- Overload should be avoided.

- Chips remain in the hole.

G. Application

- Used for radial drilling
- Updrilling operations
- Used in horizontal, vertical drilling
- Slotter machines

III. CONCLUSION

This article gives a good solution to the small scale industries that cannot afford a separate slotting machine, and have in possession a drilling machine, and may require doing certain slotting operations. This unit eliminates the presence of slotting machine in machine shop. The variation of the speed of the slotting tool from that of the drill spindle makes this product a feasible one for carrying out machining operations on materials which require utmost care while fabricating. An extension of this design gives an option for carrying out slotting operations by varying the stroke length. This can be done by giving a lengthy slotted hole or a series of holes in the disc of the crank shaft instead of the hole for locking the connecting strip. This design varies the stroke length according to the necessity of the job, since the stroke length depends upon the radius of the crank. The design of the slotting attachment described in this work is simple, portable type, low cost than the other machines available in the market. The operating principle of this machine is very simple, thus making this project a successful one.

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