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DESIGN OF ANGULAR WAY DRILLING MACHINE

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Abstract - *Engineers are always developing sophisticated machines and modern techniques. Complicated components with requirement of angular drilled holes cannot be drilled with the vertical drilling machine. The current scenario does not provide any arrangement for the angular drilling hole. In our project the system can be rotated in three directions for drilling purpose. Therefore, the job setting is not complicated as well as reduces the setting time for the drilling operation. Materials like wood, plastic, aluminum and light metal can be drilled with this. In a drilling machine holes can be drilled quickly and at a low cost. This angular drilling machine provides different angle drilling on the working job. Square and circular plate and up/down mechanism is available in this Angular Drilling Machine.*

Key Words: spur gear, Lead Screw, Portable drill machine chuck, Drill vice, Angular table, etc...

1. INTRODUCTION

Drilling machine is one of the important machine tools in a workshop. It was designed to produce a cylindrical hole of required diameter and depth on metal work pieces. The holes can be drilled by different machine tools in shop; drilling machine is designed specifically to perform the operation of drilling and similar operations. Currently the drill heads with 90degree inclination provided are readily available in the market for drilling the inclined holes. But it can drill holes only in the 90 degree. The aim of our project is to drill the holes from 0degree to 90 degree. Moreover the time to drill the holes is reduced by providing the saddle slide ways in, both directions, which supports the job to change the positions of job. The problem of angular drilling is thus solved and the time required to drill holes is lowered.

1.1 HISTORY OF WORK AXIS

1.1.1 ANGLE VISE

A machine table vice is equipped with jaws which clamp against the work piece, holding it secure. The vice can be bolted to the drilling table or the tail can be swung around to lay against the column to hold itself steady. Below are listed many types of special purpose machine table vises available to machine operators. The standard machine table vise is the simplest of all vises. It is equipped with two precision ground jaws

1.1.2 ANGULAR DRILLING MACHINE

The working operation of this angular drilling machine is initially started from the universal motor through A.C. Power source. In this, there is one power sources, received from the power supply. After that the indexing mechanism is controlled, to fix the desired angle. A lock nut is attached to the indexing plate to avoid and deviation of angle

1.1.3 ANGLE PLETE

An angle plate is a work holding device used as a fixture in metalworking. The angle plate is made from high quality material (generally spheroid cast iron) that has been stabilized to prevent further movement or distortion. Slotted holes or "T" bolt slots are machined into the surfaces to enable the secure attachment or clamping of work pieces to the plate, and also of the plate to the worktable. Angle plates also may be used to hold the work piece square to the table during marking-out operations. Adjustable angle plates are also available for work pieces that need to be inclined.

2. DESIGN PROCEDURE

Initially the component was designed, modeled and edited to get the necessary details for designer of the table (saddle). Secondly the individual parts such as Base Plate, Locator, Clamping Devices, lead screw, spur gear, handle and bevel gear has been developed. All these parts have been designed, Modeled, Drafting has been done individually. The whole Design Procedure was completed with the help of **creo 3.0(ptc) 2014** software by which the software helps for Designing, Drafting Assembly and Analysis which may be useful for customized applications and manipulations.

- **Lead Screws**

Linear motion can be achieved by means other than through the use of lead screws. Chain and cable drives along with belt and pulley drives do not require pumps and support hardware as do hydraulic and pneumatic systems. They can carry very small to very heavy loads at great speeds when needed. However, these systems are not as accurate or as repeatable as lead screws, and they generally require a greater number of components, are more

complicated to install, and require more maintenance during operation. In addition, recalculating or running chains, cables, or belts can be a safety hazard

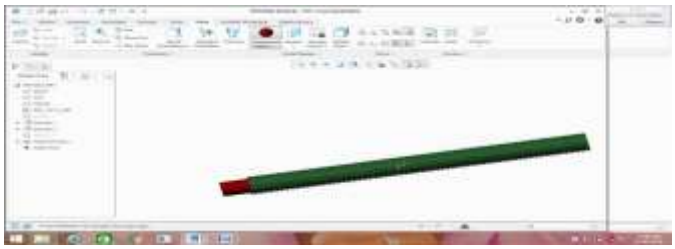


Fig -1: lead screw

Another component

- Saddle
- Bevel gear
- Spur gear
- Saddle table
- Drill head
- Column
- Clamp
- Bed
- Bottom plate

2.1 DESIGN CALCULATIONS

- **Spur gear**

Reference diameter (d)

d = zm

= z m = 25 x 2

d= 50mm

Tip diameter (da)

da = d + 2 m

= d + 2 m = 50 + 4

da = 54mm

Root diameter (df)

df = d −2.5 m

= d – 2.5 m = 50

df = 45mm

where,

d- outer diameter of gear

z- no of teeth

m- module for data book

- **Bevel gear**

Number of the teeth on the driver = 18 (from design data book)

Number of the teeth on the driven = 9

Gear ratio= Z2/Z1=i

i=9/18=0.5

d1=m×z1

m= 51/18

m=2.833

so,

standard module=3mm

1. Dia of driver gear, d1 = 51mm
2. dia of driven gear,d2= 31mm
3. Pressure angle assume initially=20degree

Pitch angle δ2 =tan▫-1(0.5)

=26.56 degree

Pitch angle δ1 = 90 - δ2= 90- 26.56

= 63.43 degree

Cone distance, R = 0.5×3×18+9

= 40.5mm

Transverse module, Mt = R/ 0.5× (Z1+Z2)

= 40.5/0.5× (18+9) = 3mm

Addendum, ha = 3mm

Dedendum, hf = 1.2×mt

= 1.2×3 =3.6mm

Clearance, c = 0.2×mt

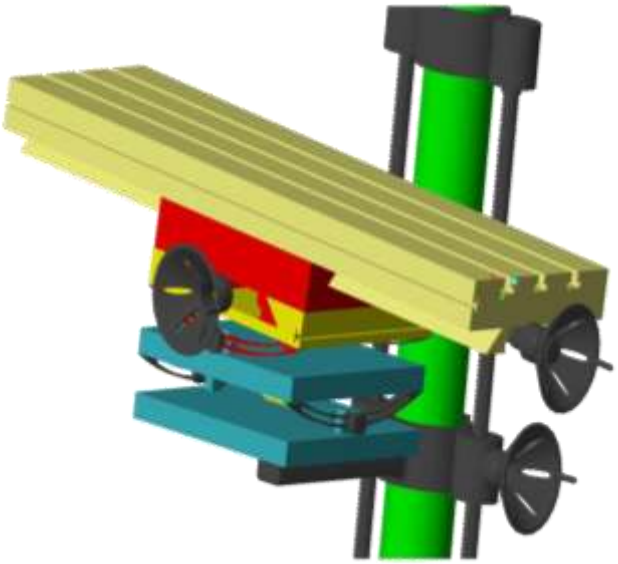
= 02×3= 0.6

Addendum angle, a =tan a1

=tan a2 = mt×fo/R

= 3×1/40.5=0.07deg

2.2 FINAL DESIGN FOR PROPOSED DRILLING MACHINE



They are design components will be assemble for proposed drilling machine

2.3 WORKING FOR PROPOSED DRILLING MACHINE

Angular ways Drilling machine table with hand feed drill machine has two main parts first drill head & another drill table. Job holding table assembly normally involves Angular Ways work piece moving adjustments .While adjustment of drill table during jobholding also in inclined whole drilling. In this project job moves in Angular ways. The coordinates of moving drilling machine table with auto feed drill machine capable of drilling straight as well as inclined hole which is requirement for industry. The motion of drill table as given below,

- Linear +X & -X.
- Linear +Y & -Y.
- Linear +Z & -Z.
- Clockwise +Z & Anticlockwise –Z.
- Angular Inclination about X-axis.
- Angular Inclination about Y-axis.

In additional it provided auto feed drill machine at upper side of the drill table which can give drill machine feed by using motor & linear Guide ways Up & Down.

3. CONCLUSION

This proposed drill machine gives a better operational stability with reference to the drilling machine. It also seems that it is more advantageous over the conventional drilling machines. There easy operate to angular holes so it gives better control during the operation. The joints are made in such a way that it can rotate in all the directions and the can perform better, so it works as we have expected. It reduces the human efforts required for the drilling operations and also reduces the overall energy consumption required for performing the same operations. It also requires less space and it is easy to handle.

Advantages

- Any degree angle hole can be done
- Materials to have cast iron, so load will accept
- Double lead screw to using for load carriage

Application

- To put angular and straight holes with high precession on engine heads and blocks and cylindrical shell Used in general furniture making angle

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