

Design and Development of Angular Drilling Attachment with Quick Acting Clamp for Lathe Machine

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Abstract— The basic function of our Angular Drilling Attachment is to drill the angular holes on lathe machine. But, further we have enhanced our fixture by employing quick indexing mechanism into it. At first, the whole attachment is fixed on the lathe machine cross slide by means of bolting or clamps. The work piece is fitted on the attachment by means of mandrel and bolt. To drill holes at angle, the swing plate is clamped at required angular position with respect to cross slide. The drill bit is held in the chuck and drilling is done on the work piece by means of axial movement of longitudinal slide. In addition to above mentioned attachment, we have made a small Quick Action Clamp, which can be used for rapid clamping and releasing action. The working principle of this clamp is Wedge Action.

Keywords: - Angular Drilling, Quick Indexing Mechanism, Quick Action Clamp, Wedge Action.

1. INTRODUCTION

In today's fast growing world, there is a necessity of very fast & accurate devices. So, in modern manufacturing industries, there is a demand of very precise as well as economical production in less time.

But, in machining processes, there is very high ratio of unproductive time to machining time. Because in for machining operations, firm and rigid clamping of work piece is required in less time. Rigid clamping requires high amount of clamping force by workers. Which in turn, get them into tiredness. So, we have planned to make such a mechanism that will require very little amount of human effort for clamping and simultaneously, it will clamp the job in very less time. Hence, there will be rapid clamping action. Therefore, it is known as *Quick Acting Clamp*.

Over and above, we are also developing one attachment for the purpose of drilling angular holes on work piece which can be used on lathe, drill and milling as well as on CNC/VMC machines. It will be very accurate and economical for drilling angular holes, making straight as well as angular slots and keyways. Further, it will be capable of manufacturing spur, helical gears also. So, our main focus is to obtain the high flexibility in manufacturing, reduce human effort, decrease unproductive time and making very economical fixture and clamps very conventional as well as non-conventional machines.

2. LITERATURE SURVEY

• Existing fixture design for drilling

A drilling fixture for drilling either cylindrical or flat work pieces on or off center is disclosed. The fixture includes a base having v- shaped groove for receiving larger cylindrical work pieces, a pair of smaller v shaped openings in the side walls of the base for receiving smaller cylindrical work pieces, a cover attached to the base and a rotatable, index able drill bushing mounted to the cover.

This invention relates to a drilling fixture for accurate positioning of drill bits and control of the direction during cylindrical shaped surfaces either on or off center. The drilling fixture locates the drill bits precisely with the spot to be drilled, maintains the drill in that location without wondering during the drilling operation whether drilling the curved or flat surfaces and maintains the alignment of drill throughout the drilling operation. A tool is used for guiding and ensuring the correct position for cross drilling in a rod. Further tool will function as various types of work holders or tool holders. The tool is a cube with chamfered corners that form eighteen sided symmetrical polygons. Each side has bored holes therein arranged in an appropriate size and location to permit the tool to be used for its many functions.

This device consists of a one piece, uniformly square metal cube having all corners chamfered at a 45-degree angle to provide each corner with flat surface to yield an 18 sided symmetrical polygon. Seventeen of the side provided with bored holes of different sizes with each hole concentric and parallel to the center line of two opposite and parallel surface of the cube.

U.S. pat. No. 4,955,766 discloses the combination of drill bit with the stop collar and a fixture used for making pocket holes at an angle to the surface of the work piece. The fixture has L-shaped base with one leg serving as a guide portion for job and other portion holding a clamping device. An angled channel having a stop flange at its upper end is provided on guide portion leg. The drill bit inserted into channel and drills the hole at an angle up to the point where the stop collar engages the flange.

3. PROPOSED METHOD:

As we all know, Lathe machine is capable of doing almost all kind of operations, although, it is not able to do Angular drilling on work-piece. Further, it can't do indexing for drilling many holes on pitch circle diameter.

The basic function of our attachment was to drill the angular holes on lathe machine. But, further we have enhanced our fixture by employing quick indexing mechanism into it. At first, the whole attachment is fixed on the lathe machine cross slide by means of bolting or clamps. The angle plates are two supporting structures which are used to support as well as allow rotary motion to the swing plate.

The angles are calibrated on the angle plate. Swing plate can be clamped at any angle with reference to machine cross slide by means of bolts. One hole is drilled in swing plate in order to support the mandrel on swing plate. One counter-bore with high accuracy and surface finish is made on the swing plate. In this counter-bored hole, one bearing is tightly fitted, for providing friction less rotary motion to the mandrel.

One groove is made in the swing plate, in which cir-clip will be fitted. The cir-clip will prevent the bearing to come out from the swing plate due to cutting forces. For doing quick indexing of job, one spur gear is fitted on the backside of the mandrel. The indexing pin and spring are used along with the spur gear to complete the operation.

Over and above, one slot will be made on one of the angle plate in order to permit the angular motion of the indexing pin along with the swing plate.

4. IMPLEMENTATION DETAILS:

A. Experimental Setup:

The implementation of this proposed model was carried out by master cam software. Master cam is a computer aided manufacturing (CAM) software program used by the manufacturing professionals, such as machinist and computer numerical control (CNC) programmers.

B. Experimental Results:

- 1) We have made an attachment which can surely replace Drilling machine, milling machine, and Drilling machine for operations such as angular drilling, gears, slots, key-ways and many more.
- 2) By using indexing gear, multiple holes can be drilled at any angle.
- 3) Apart from that spur gear as well as helical gears can be made by the use of this attachment.
- 4) Moreover, key-way milling and slots are now possible on the lathe machine.
- 5) Approximately 1 Lac INR can be saved by our project.
- 6) For mass production purpose we have made quick acting clamps which can hold 24 objects simultaneously.
- 7) Quick acting clamps can reduce $\frac{2}{3}^{\text{rd}}$ of un-productive time.

This model is directly clamp on the lathe machine bad and after that the machining operation is carried out. This attachment is used for making an angular hole on the work-piece easily. For that we used indexing gear mechanism.

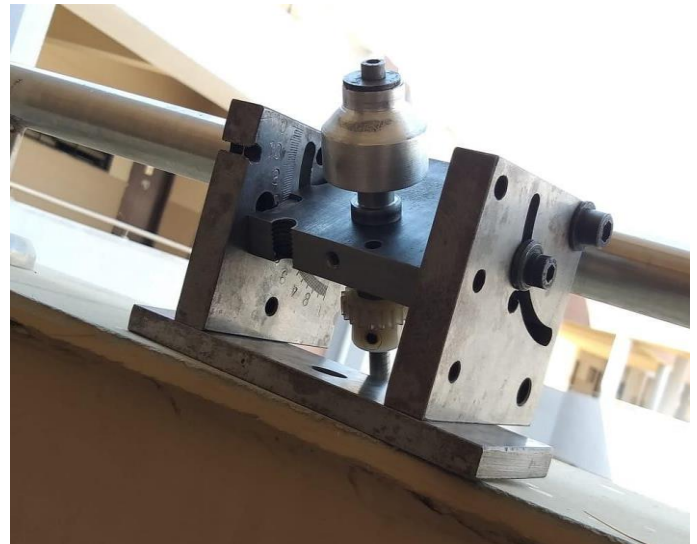


Figure 1: Angular Drilling Attachment

For mass production purpose we made a quick acting clamp on which we directly hold 24 objects directly. It can also reduce unproductive time up to $\frac{2}{3}^{\text{rd}}$ time.



Figure 2. Quick acting clamp plate

The below figure 3. shows a one piece of quick acting clamp which can be fitted by the Allen key on quick acting clamp plate.

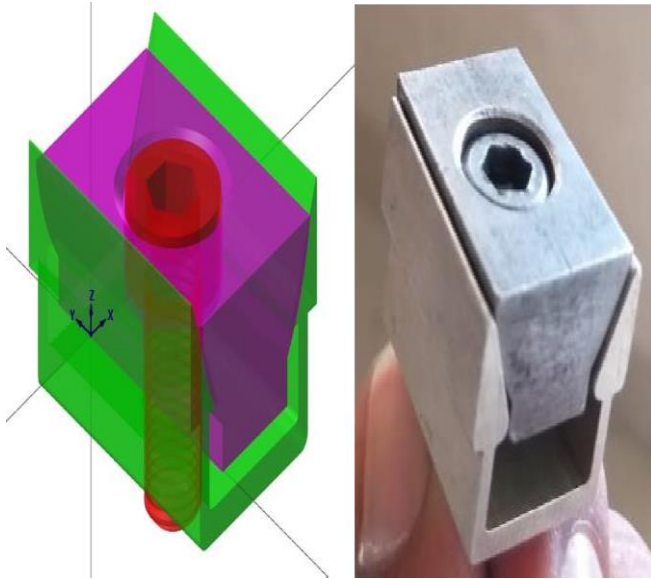


Figure 3. Quick acting clamp

5. CONCLUSION AND FUTURE SCOPE

In the present as we all know that lathe machine is mother of all the machines because most of operations are performed on it such as cutting, sanding, knurling, turning, facing and many more but when it comes to angular drilling and making helical gears it is not work. so for that we implement our attachment for making angular holes. And also for load and unload the work-pieces we made quick acting clamp mechanism on which we hold 24 objects simultaneously which reduces the unproductive time.

In the future work, Further, we will attach one motor and gear box with the mandrel, so this attachment will replace 3 machines, namely: Drilling M/C, Milling M/C, and Shaping M/C. Apart from this, in future we will make a vertical slide on which the whole attachment can be mounted and can slide vertically across it and will help in accurate and precise indexing of work piece.

6. REFERANCES

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