Attachment for Flutless Tap on Tool and Cutter Machine

[1]Prof.Amol Kalhapure, [2]Bhagwat Khedkar, [3]Mayur Nere, [4]Vivek Dhanorkar, [5]Omkar Deshmukh

[1]Assistant Professor, [2,3,4,5]UG Students
Mechanical Engineering Department
G.H. Raisoni College of Engineering and Management, Chas, Ahmednagar, India

***Abstract*: In today's world manual errors are the major cause of concern for mass production as well as batch production of components in manufacturing industries. Now a day, there is tremendous development in the production industry and their relevant machinery to improve the productivity. But still in small, medium and some large scale industries uses the conventional method in some of the operations accuracy and productivity are the key to survivals. It relate to the same kind of machine which certainly does not use the complete automation but will satisfactorily reduce the manual error to fulfil the requirements accuracy during the production.**

***Keywords*: Error, Automation, Accuracy, Productivity**

I.INTRODUCTION

There is a tremendous technological development in the manufacturing industry and manufacturing industries are making large amount of effort for their mass production with best quality products having higher reliability and economical in cost. Now-a-days the hand operated machines are replaced with the application of automation in automatic or semi-automatic machines which utilize to improve the productivity. Spiral point on a tap is provided for easy removal of chips during the process of material removal. Spiral point also known as gun nose or bull nose or chip driver. The prime objective of this project is to improve the consistency in the geometry of the final product i.e. the spiral point tap. Also the secondary objective is to improve the production rate by reducing the time required for conditioning of the grinding wheel during the operation for the proper functioning of it. This time to time conditioning in the form of dressing is quite necessary in order to obtain the better material removal rate, but it consumes the most precious time which is not desirable by the industry in order to keep pace with their market requirement in the era of competition.

II. LITERATURE REVIEW

Povilas Krasauskas et.al presented new method for forming threaded holes in thin-walled work pieces using a combined hole making and tapping tool. The main advantages of the developed combined tool in compare to currently widely used separate drilling and tapping tools are that it eliminates the inter-operational time related to tool changing and reduces the machining time [1]. Tejas Soni et.al. stated that many industries nowadays are using automation for their production process. Automation has great advantages over manual labour but setting up an automated machine like VMC, automatic turning centre, CNC lathe is very costly. A conventional machine can be made to work as a CNC machine by changing guide way or fixture. Jobs of conventional upright drilling machine require positioning of drill over all holes location which can be done more easily by adjusting the guide way or fixture. The spindle is fixed so only option is to move the work piece with help of fixture [2].

S. Huber et.al. explained in this paper, an alternative process for dressing electroplated CBN grinding wheels using an ultra-short pulsed laser is presented. Other than abrasive grains dressed conventionally, laser touch dressed CBN grains exhibit cutting edges that have partially defined geometric elements with a positive clearance angle. Grinding experiments, including long-term tests, are performed on hardened steel, for a comparative study on the performances of laser dressed and conventionally dressed tools. While the processing forces are slightly higher for the laser touch dressed tools, the roughness of the ground surface is improved. Single layer electroplated CBN grinding wheels are increasingly put to use by reason of their high wear resistance, grit protrusion and large chip accommodation volume [3].

Gaurav Upadhyay et.al explained Cylindrical grinding which is one of the most important metal cutting processes used extensively in the Metal finishing operations. Metal removal rate and surface finish are the important output in the production with respect quantity and quality respectively. The object of this paper is to arrive at the optimal grinding conditions that will maximize metal removal rate when grinding IS 319 brass. Empirical models were developed using design of experiments by Taguchi L9 Orthogonal Array and the adequacy of the developed model is tested [4].Daneshi A et.al investigated Performance of grinding operation is influenced by variety of factors amongst which dressing process is the most important. Through the dressing process, the grinding wheel topography is produced. This affects, in turn, directly the grinding forces, work piece surface quality and grinding wheel wear. This research aims to develop appropriate dressing strategies for small abrasive wheels in internal cylindrical grinding [5].

F. Kuster et.al determined preparation of grinding tools is the most important enabling factor in the grinding process. It influences the material removal rate, the grinding forces, the surface quality as well as the material properties of the subsurface zone, and is the key issue for subsequent wear of grinding tools. The evolving and conventional conditioning technologies are reviewed based on technical and commercial aspects [6]. Yali Hou et.al studied about high-efficiency abrasive process with CBN grinding wheel is one of the important techniques of advanced manufacture. Combined with raw and finishing machining, it can attain high material

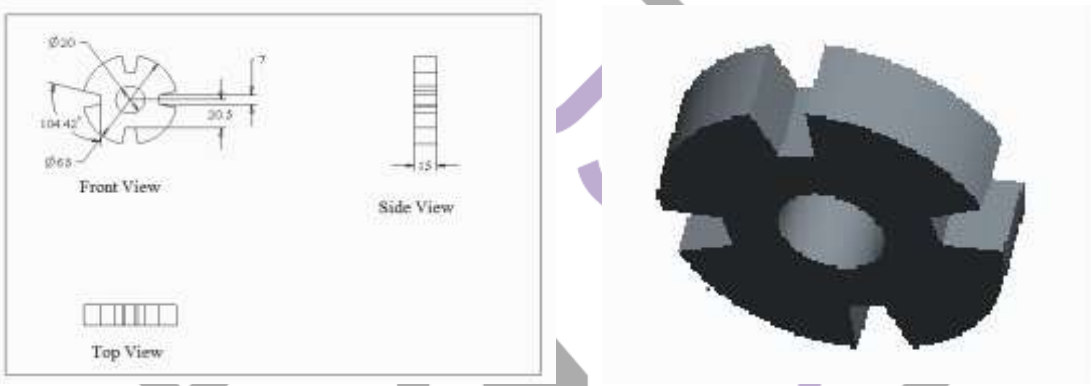
removal rate like turning, milling and planning. The difficult-to-grinding materials can also be ground by means of this method with high performance [7].

III.METHODOLOGY

1. Indexing Plate

Indexing in reference to motion is moving into a new position or location quickly and easily but also precisely. When indexing a machine part, its new location is known to within a few hundredths of a millimetre, or often even to within a few thousandths of a millimetre, despite the fact that no elaborate measuring or layout was needed to establish that location. In reference to multi-edge cutting inserts, indexing is the process of exposing a new cutting edge for use. Indexing is a necessary kind of motion in many areas of mechanical engineering and machining. Indexing is most often the quick and easy but precise rotation of a machine part through a certain known number of degrees. Positioning a work piece at a precise angle or interval of rotation for a machining operation is called indexing.

Indexing is an operation of dividing a periphery of a cylindrical work piece into equal number of divisions by the help of index crank and index plate. A manual indexing head includes a hand crank. Rotating the hand crank in turn rotates the spindle and therefore the work piece. The hand crank uses a worm gear drive to provide precise control of the rotation of the work. The work may be rotated and then locked into place before the cutter is applied, or it may be rotated during cutting depending on the type of machining being done.

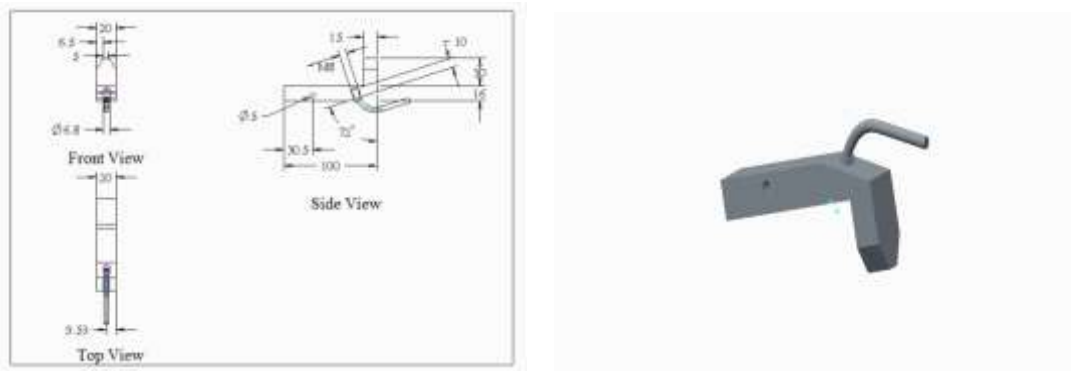


(A) 2D model (B) 3D model

1 Indexing Plate.

2. Lever

A lever is a simple machine consisting of a beam or rigid rod pivoted at a fixed hinge, or fulcrum. A lever is a rigid body capable of rotating on a point on itself. On the basis of the location of fulcrum, load and effort, the lever is divided into three types. A lever amplifies an input force to provide a greater output force, which is said to provide leverage. The ratio of the output force to the input force is the mechanical advantage of the lever. The lever is a movable bar that pivots on a fulcrum attached to or positioned on or across a fixed point. The lever operates by applying forces at different distances from the fulcrum, or pivot. The location of the fulcrum determines a lever's class. Where a lever rotates, continuously, it functions as a rotary 2nd-class lever. The motion of the lever's end-point describes a fixed orbit, where mechanical energy can be exchanged. The motion of the lever's end-point describes a fixed orbit, where mechanical energy can be exchanged.



(A) 2D model (B) 3D model

Fig. 2 Lever

3. Tool and Cutter Machine

It is an extremely versatile machine used to perform a variety of grinding operations: surface, cylindrical, or complex shapes. The machine is manually operated, however highly automated Computer Numerical Control (CNC) machines are becoming increasingly common due to the complexities involved in the process. The operation of this machine requires a high level of skill. The two main skills needed to understand the relationship between the grinding wheel and the metal being cut and knowledge of tool geometry. The huge variety in shapes and types of machining cutters requires flexibility in usage. A variety of dedicated fixtures are included that allow cylindrical grinding operations or complex angles to be ground.

Fig. 3 Assembly of Tool and Cutter Machine

IV. EXPERIMENTAL SETUP

1. Construction

- Firstly the main task was to select the proper grinding wheel which was of prime importance. The selection was to be done on the basis of time required for dressing (which was meant to be kept low) and the life of the grinding wheel.
- Through above step we decided to go for electroplated Nickel CBN Wheel (Cubic Boron Nitride). This grinding wheel was selected because it does not require dressing throughout its life and it has longer life as compared to Aluminum Oxide Grinding wheel.
- It all started with selecting the Casprove for holding the work piece throughout the operation. This part is to be fitted inside the tailstock spindle.
- The lever and spring attached to it is to be designed next. This spring helps the lever to retain to its original position.
- Now the indexing plate is to be designed which will be in accordance with the part to be manufactured. This means whether the spiral point tap has two, three or four spiral points to be cut.
- The next task is to design a lever which will hold the indexing plate to its position which is attached to the tailstock spindle. This lever is attached with a spring to hold its position throughout the cycle.
- Now the casing for this mechanism is to be designed according to size and shape of tailstock mechanism. This does not require any specific design procedure but has arrangements to be connected to degree mechanism.
- This whole assembly of indexing mechanism as well as degree mechanism is rested on a tool and cutter machine bed with the help of carriage slide to enhance its motion.
- The whole assembly is done but the high speed super abrasive grinding wheel produced fumes during operation and the burr generated during the operation was being thrown at the operated during the work cycle. Hence there was need to implement the coolant circulation mechanism and a casing for the machine. But the need of the coolant was varying with the size of the tap tool to be manufactured.

Fig. 4 Attachment with Indexing Mechanism

WORKING

The headstock is provided spindle head and casprove for holding the tool. The tool is holed in the spindle of headstock. The grinding wheel is mounted on the prime mover of motor. As the power is transmitted the wheel starts rotating about its axis. The headstock is moved with the help of hand operated lever in the forward and reverse direction. As the head moves the wheel cuts the slots or grooves on tap tool. As tool gets cut the spindle has to be rotated with the help of lever indexing mechanism for another cut with desired distance. It is repeated for several times as a result of good surface finish. The lever and indexing mechanism is used for equidistance rotation of tool. The coolant is provided for heat dissipation and for removal chips. But the need of the coolant was varying with the size of the tap tool to be manufactured.

V. RESULTS & DISCUSSION

Sr. No.	Parameter	Before Attachment	After Attachment
1.	Productivity	Near about 23 jobs can be manufactured using single grinding wheel (Al_2O_3)	Near about 45 jobs can be manufactured using single grinding wheel (Electroplated Nickel CBN)
2.	Material Removal Rate	Low material removal rate	High material removal rate
3.	Dressing	Dressing required	No dressing is required
4.	Operator Requirement	Operator needs to be skilled inevitably	No such need of skilled operator, as anyone can easily operate the machine

The dressing in this newly designed attachment is not mandatory, hence it saves the most essential resource of the company, i.e., time. Also due to elimination of dressing, the cycle time of the process is reduced up to a pretty good extent. This has been one of the biggest achievements. Due to high speed the material removal rate is increased as compared to previous one. Also more productivity and accuracy of the product are the most desired results which we obtained. Before skilled operator was required for good accuracy but now this requirement can also be eliminated.

VI. CONCLUSION

Firstly we used finger point attachment method for cutting operation but it seems few drawbacks. We analysed the problems in cutter and suggest some remedies to overcome the problem in cutter then we start and perform some analysis like geometric, force, deformation by using CAD/CAM software and we get some useful output. Therefore we prefer to replace this method by indexing mechanism and this proposed mechanism endorses the reduced human interface which will certainly result in improved accuracy, increased production rate (less cycle time), consistency in geometry of the tool. Recent we select the parameters and materials to perform future operation or process.

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