IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 4, May 2022
Impact Factor: 6.252

Angular Drilling Machine

Mr Bryan Augustine[1], Mr Bhavesh Godse[2], Mr Sujay Sonar[3], Mr Nikhil Rane[4], Mr Mahesh P Kolhe[5]
Department of Mechanical Engineering[1,2,3,4,5]
Sir Visvesvaraya Institute of Technology, Nashik, Maharashtra, India

Abstract: *Now a day, machines are widely controlled by embedded system. To meet the need of exploding population economic and effective control of machines is necessary. Our project even is rotated to easily drill at any direction. So that job setting operation is not complicated as well as reduces the setting time for the operation. It also takes into consideration the most effective method of controlling the drilling machine by manually. Materials like wood, plastic and light metals can be drilled with this. The work piece is fixed on the work table, which is provided with a moving arrangement. The drilling machine is one of the most important machine tools in a workshop. In a drilling machine hole may be drilled quickly and at a low cost. The hole is generated by the rotating edge of a cutting tool known as the drill, which exerts large force on the work clamped on the table. As the machine tool exerts vertical pressure to original a hole it loosely called a "drill press". Drilling is the operation of producing circular hole in the work-piece by using a rotating cutter called drill, the most common type of drill is the twist drill. The machine tool used for drilling is called drilling machine. The drilling operation can also be accomplished in a lathe, in which the drill is held in the tailstock and the work is held and rotated by a chuck. This angular drilling is performed for Different Angle Drilling in the working job. Indexing Plate and Up/down mechanism is available in this Angular Drilling Machine.*

Keywords: Drill Machine, Motor, Clamp, Table

I. INTRODUCTION

In the19th century, industrial revolution takes place. After those industries are developed on the large scale. Products are required to produce by the mass production techniques to reduce the cost. For that purpose, different techniques are developed. As many processes have to take places simultaneously, there is need for the helping working. For doing different work we need help. Special purpose machines are developed for this. In the perforation of different work for that machine is defined as a device or machine which works according to our order. Our order should be completed in time with precision so the term called Machine comes into play. "Machine – A servant play's important Role in it." In the field of Technology, everyday any technique is ruled. It has his own characteristic due to which we have to a dioptid. Today is the World of "New Technology" which we have to take in practice. Machines is one of the areas in the development. Machines are widely used in the Mechanical field. In the mechanical Industries, machines are widely used for the art of wing assembly, material handling, coating facility, manufacturing processes (cutting, drilling, welding etc.). Machines could accomplish many Boring repetitive tasks for us. Machine can do hazardous jobs and can reach places where it's difficult for human beings to reach. Machines, which substitute the manned activities in space, are known as space machines. Machines are desirable for certain work functions in industries because, as unlike humans, they never get tired; they can endure physical conditions that are uncomfortable or even dangerous; they can operate in airless conditions also; and they cannot be distracted from the task at hand.

II. COMPONENTS OF DRILLING MACHINE

- Sleeve: The sleeve or quill assembly does not revolve but may slide in its bearing in a direction parallel to its axis. When the sleeve carrying the spindle with a cutting tool is lowered, the cutting tool is fed into the work: and when it's moved upward, the cutting tool is withdrawn from the work. Feed pressure applied to the sleeve by hand or power causes the revolving drill to cut its way into the work a fraction of an mm prerevolution.
- Spindle: The spindle holds the drill or cutting tools and revolves in a fixed position in a sleeve.
- Column: The column is cylindrical in shape and built rugged and solid. The column supports the head and the sleeve or quill assembly.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 4, May 2022
Impact Factor: 6.252

- Head: The head of the drilling machine is composed of the sleeve, a spindle, an electric motor and feed mechanism. The head is bolted to the column.
- Worktable: The worktable is supported on an arm mounted to the column. The worktable can be adjusted vertically to accommodate different heights of work or it can be swung completely out of the way. It may be tilted up to 90 degree in either direction, to allow long pieces to be end or angle drilled.
- Base: The base of the drilling machine supports the entire machine and when bolted to the floor, provides for vibration-free operation and best machining accuracy. The top of the base is similar to the worktable and may be equipped with t- slot for mounting work too large for the table.
- Hand Feed: The hand- feed drilling machines are the simplest and most common type of drilling machines in use today. These are light duty machine that are operated by the operator, using a feed handled, so that the operator is able to "feel" the action of the cutting tool as it cuts through the work piece. These drilling machines can be bench or floor mounted.
- Power feed: The power feed drilling machine are usually larger and heavier than the hand feed ones they are equipped with the ability to feed the cutting tool in to the work automatically, at preset depth of cut per revolution of the spindle these machines are used in maintenance for work that uses large drills that require power feed larger work pieces clamped directly.

III. Types Of Drill Machine

A) Based on Construction

- Portable
- Sensitive
- Radial
- Up-right
- Gang
- Multi-spindle

B) Based on Feed

- Hand driven
- Power driven Some of the mainly used drill machine can be explained in derails as given below

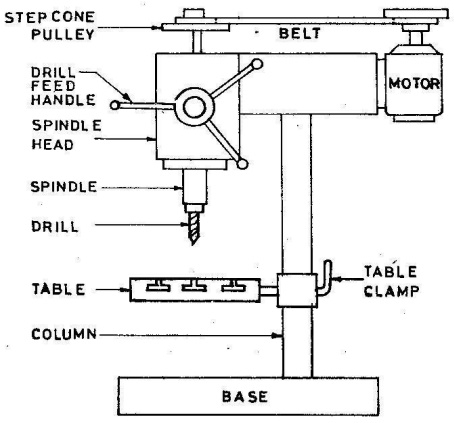


Figure 1: Sensitive Drilling Machine.

Sensitive or Bench Drilling Machine:

- This type of drill machine is used for very light works. Fig.1 illustrates the sketch of sensitive drilling machine.
- The vertical column carries a swiveling table the height of which can be adjusted according to the work piece height.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 4, May 2022
Impact Factor: 6.252

- The table can also be swung to any desired position.
- At the top of the column there are two pulleys connected by a belt, one pulley is mounted on the motor shaft and other on the machine spindle.
- Vertical movement to the spindle is given by the feed handle by the operator.
- Operator senses the cutting action so sensitive drilling machine.
- Drill holes from 1.5 to15mm

IV. Drilling Operations

Operations that can be performed in a drilling machine are: Drilling, Reaming, Boring, Counter boring, Countersinking, Tapping.

1 Drilling: It is an operation by which holes are produced in solid metal by means of revolving tool called 'Drill'. Fig. shows the various operations on drilling machine.
2 Reaming: Reaming is accurate way of sizing and finishing the pre-existing hole. Multi tooth cutting tool. Accuracy of 0.005mm can be achieved
3 Boring: Boring is a process of enlarging an existing hole by a single point cutting tool. Boring operation is often preferred because we can correct hole size, or alignment and can produce smooth finish. Boring tool is held in the boring bar which has the shank. Accuracy of 0.005mm can be achieved.
4 Counter Bore: This operation uses a pilot to guide the cutting action to accommodate the heads of bolts. Fig. illustrates the counter boring, countersunk and spot facing processes.
5 Countersink: Special angled cone shaped enlargement at the end of the hole to accommodate the screws. Cone angles of 60°, 82°, 90°, 100°, 110°, 120°.
6 Tapping: Tapping is the process by which internal threads are formed. It is performed either by hand or by machine. Minor diameter of the thread is drilled and then tapping is done. Fig. show the tapping processes.

V. Literature Review

Historically, metals were drilled using the manual hand-held drilling machine. Later, the electronic drilling machine came into existence with the advancement in the industrial engineering. In olden days, before drilling the hole over the work piece, it needed to be tapped with the conventional tapping head. After tapping the small hole over the work piece, it provided the initial guide way to the manual handheld drill machine. The manual hand-held drill machine is provided with the rotating handle with the bevel gear arrangement. The faster the speed of handle rotated the drill tool with higher speed. Around 35,000 BC, Homo sapiens discovered the benefits of the application of rotary tools. This would have rudimentarily consisted of a pointed rock being spun between the hands to bore a hole through another material. This led to the hand drill, a smooth stick that was sometimes attached to flint point, and was rubbed between the palms. This was used by many ancient civilizations around the world including the Mayans. The earliest perforated artifacts, such as bone, ivory, shells and antlers found, are from the Upper Palaeolithic era. Bow drill (strap-drills) are the first machine drills, as they convert a back-and-forth motion to a rotary motion, and they can be traced back to around 10,000 years ago. It was discovered that tying a cord around a stick, and then attaching the ends of the string to the ends of a stick (a bow), allowed a user to drill quicker and more efficiently. Mainly used to create fire, bow-drills were also used in ancient woodwork, stonework and dentistry. The core drill was developed in ancient Egypt by 3000 BC (5016 years before now). The pump drill was invented during Roman times. It consists of a vertical spindle aligned by a piece of horizontal wood and a flywheel to maintain accuracy and momentum. The hollow-borer tip, first used around the 13th century, consisted of a stick with a tubular shaped piece of metal on the end, such as copper. This allowed a hole to be drilled while only actually grinding the outer section of it. This completely separates the inner stone or wood from the rest, allowing the drill to pulverize less material to create a similarly sized hole.

While the pump-drill and the bow-drill were used in Western Civilization to bore smaller holes for a larger part of human history, the Auger was used to drill larger holes starting sometime between Roman and Medieval ages. The auger allowed for more torque for larger holes. It is uncertain when the Brace and Bit was invented; however, the earliest picture found so far dates from the 15th century. It is a type of hand crank drill that consists of two parts as seen in the picture. The brace, on the upper half, is where the user holds and turns it and on the lower part is the bit. The bit is interchangeable as bits wear

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 4, May 2022
Impact Factor: 6.252

down. The auger uses a rotating helical screw similar to the Archimedean screw-shaped bit that is common today. The gimlet is also worth mentioning as it is a scaled down version of an auger. The next great advancement in drilling technology, the electric motor, led to the invention of the electric drill. It is credited to Arthur James Arnot and William Blanch Brain of Melbourne, Australia who patented the electric drill in 1889. In 1895, the first portable handheld drill was created by brothers Wilhelm & Carl Fein of Stuttgart, Germany. In 1917 the first trigger-switch, pistol-grip portable drill was patented by Black & Decker. This was the start of the modern drill era. Over the last century the electric drill has been created in a variety of types and multiple sizes for an assortment of specific uses.

VI. Problem Statement

The conventional drilling machine used in the industrial application have the vertical drilling heads with table mounted below the drill head. This type of arrangement provides a single degree of freedom for the movement of the drilling tool i.e. it can move only in upward and downward direction with the manual feed by operator. The modernized drilling machine have the indexing arrangement with single degree of freedom such that the feed can be adjusted to the desired level, it can only move in upward and downward direction. The main disadvantage in this modernized drilling machine is that the degree of freedom being one that is the drilling tool can move only in upward and downward direction. The main advantage for this drilling machine is that feed can be controlled by the indexing mechanism provided for the drilling tool head.

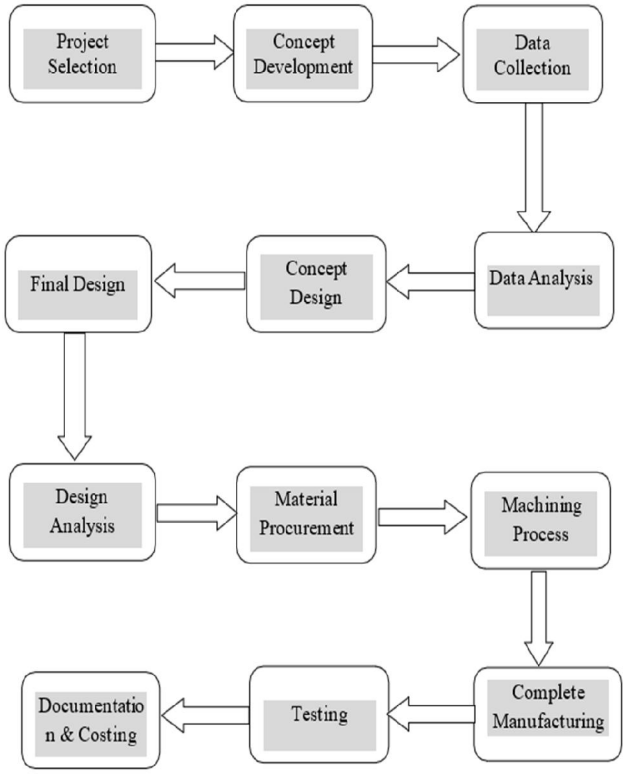
The various disadvantages and drawbacks of previous drilling machine needed to be considered and worked on. Considering the degree of freedom, feed rate, work table durability, machine feasibility we started to modify the new drill machine. Our project focuses on the angular drilling hole arrangement. The advanced angular drilling hole machine have six degree freedom in the x, y, z directions. This provides the easy and effective utilization of work table for the drilling machine operation. The feed rate for the upward and downward motion for the drill machine tool is controlled effectively by the electronic control unit. All the drawbacks and disadvantages of previous drilling machine are modified and designed in our drilling machine

VII. Objective

1 To reduce the man power & efforts in drilling operations.
2 To maintain the accuracy in drilling process.
3 To develop automation unit for the drill so that m/c can easily be adopted in today's automated plants.
4 To performed the most rigid operation with high-speed drilling in any types of drill profile. Placed after their associated figures, as shown in Fig. 1.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 4, May 2022
Impact Factor: 6.252

VIII. METHODOLOGY



The above flow chart shows the sequential operation/steps that will be performed during the project process.

IX. WORK HOLDING DEVICES

1. Machine Table Vice: The machine vice is equipped with jaws which clamps the work piece. The vice can be bolted to the drilling table or the tail can be swung around swung around. Fig. 13 shows the standard and swivel vice. The swivel vice is a machine wise that can be swivel through 360° on a horizontal plane.
2. Step Blocks: These are built to allow height adjustment for mounting the drilling jobs and are used with strap clamps and long T-slot bolts.
3. Clamps: These are small, portable vises, which bears against the work piece and holding devices. Common types of clamps are C-clamp, Parallel clamp, machine strap clamp, U-clamp etc. Fig. 2.9. Shows the correct and incorrect methods of mounting the work piece.
4. . V-Blocks: These are designed to hold round work pieces.
5. Angles: Angle plates are made in a 90°angle with slots and bolt holes for securing work to the table.
6. Jigs: The jig guides the drill through a bushing to locate and drill holes accurately.
7. T- Slots Bolt: These are special bolts which has a T shaped head, which slides into the T slots of drilling machine work table.

X. WORKING METHODOLOGY

Our 6-ways drilling machine table with auto feed drill machine has two main parts first drill head & another is drill table. Job holding table assembly normally involves six ways work piece moving adjustments, while adjustment of drill table during job holding also in inclined hole drilling. In this project job moves in 6-ways as shown in fig.3.1. Having coordinates of moving drilling machine table with auto feed drill machine which is capable of drilling straight as well as inclined hole which is requirements for industry. The motion of drill table as given below,

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 4, May 2022
Impact Factor: 6.252

1. Linear +X & -X.
2. Linear +Y & -Y.
3. Linear +Z & -Z.
4. Clockwise +Z & Anticlockwise –Z.
5. Angular Inclination about X-axis.
6. 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. 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 during drilling. According to the requirement of drilling it will tilt very precisely. The rotary motion of the indexing plate is given to the bevel gear. This rotary motion is given to the shaft and used to rotate the Drill head. The depth of cut will be adjusted by the screw in the drill head structure. The speed of motor is controlled using Regulator. After that motor is started the desire angle and desire speed is fixed then drilling process performed. With the help our project we can achieve the angular drill hole very precisely. Thus, our project can perform very tiny angular hole and variations can be achieved.

According to the requirement of drilling it will tilt very precisely. The rotary motion of the indexing plate is given to the bevel gear. This rotary motion is given to the shaft and used to rotate the Drill head. The depth of cut will be adjusted by the screw in the drill head structure. The speed of motor is controlled using Regulator. After that motor is started the desire angle and desire speed is fixed then drilling process performed. With the help our project we can achieve the angular drill hole very precisely. Thus, our project can perform very tiny angular hole and variations can be achieved.

XI. Conclusion

While concluding this report, we feel quite fulfill in having completed the project assignment well on time, we had enormous practical experience on fulfillment of the manufacturing schedules of the working project model. We are therefore, happy to state that the in calculation of mechanical aptitude proved to be a very useful purpose. Although the design criterions imposed challenging problems which, however were overcome by us due to availability of good reference books. The selection of choice raw materials helped us in machining of the various components to very close tolerance and thereby minimizing the level of balancing problem. Needless to emphasis here that we had lift no stone unturned in our potential efforts during machining, fabrication and assembly work of the project model to our entire satisfaction. The model develops by us fulfill the required objectives that it reduces human efforts & time in drilling operations. Similarly, it maintains the accuracy in linear as well as drilling process. It performed the most rigid operation with high-speed drilling in any types of drill profile. After some modifications in this machine develop automation unit for the drill so that machine can easily be adopted in today's automated plants. Hence, we are satisfied with our project work.

XII. Future Scope

The project shall concern with design & modification in conventional drill machine with drill fixture. During conventional drill machine working normally involves tedious work while adjustment of drill table during job holding also there is problem in inclined hole drilling. The scope for this project is to overcome this problem so we can do the project with auto feed drill machine which is capable of drilling straight as well as incline.

XIII. Acknowledgment

It is my immense pleasure to work on this project Angular Drilling Machine. It is only the blessing of my divine master which has prompted and mentally equipped me to undergo the study of this project. We would like to thank Dr.G.B.Shinde, Principal, Sir Visvesvarya Institute Of Technology for giving me such an opportunity to develop practical knowledge about subject. We are also thankful to Mr. Vijay kadlag, Head of Mechanical Engineering Department for his valuable encouragement at every phase of my project work and completion. We offer my sincere thanks to my guide Prof. Mr. Mahesh P Kolhe.who very affectionately encourages me to work on the subject and gave her valuable guidance time to

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 4, May 2022
Impact Factor: 6.252

time. While preparing this project We are very much thankful to her. We are also grateful to entire staff of Mechanical Engineering Department for their kind co-operation which helped me in successful completion of project.

REFERENCES

[1]. R.Anandhan, P.Gunasekaran, D.Sreenevasan, D.Rajamaruthu Design and Fabrication of Angular Drilling Machine, International Journal of Innovative Research in Science, Engineering and Technology ISSN: 2347-6710 Vol. 5, Special Issue 8, May 2016.

[2]. Vertisol Jitendra Joshi & Atul Kumar Shrivastava Modification and Performance Evaluation of Tractor Drawn Raised Bed Seed Dril,l International Journal of Agricultural Science and Research ISSN: 2250-0057 Vol. 7, Issue 3, Jun 2017, pp 385-394.

[3]. Pritam Kumar Kundu Todd, R. H, Allen, D. K. and Alting Design and fabrication of work holding device for a drilling machine, ISBN 0-8311-3049-0 vol.7 Issue 3, 2013-2014 pp. 43–48.

[4]. R.S. Bais , A.K. Gupta, B.C. Nakra , T.K. Kundra Studies in Dynamic Design of Drilling Machine Using Updated Finite Element Models, International Journal of Trend in Research and Development ISSN: 2394-9333 Vol.5 Issue 2, 2014 pp. 316-512.

[5]. Nikhil G. Lokhande and C.K. Tembhurkar Design of Angular Drilling Fixture and Analysis of Cutting Forces during Drilling on Cylindrical Surfaces, Journal of Applied Mechanical Engineering ISSN:2168-9873 Vol. 1 Issue 2 2012 pp 2-4.

[6]. L.M. Aage, Kanchan Badgujar, Rutik Hylinge, Pratik Khodade Design & Fabrication Of 6-Way Drilling Machine, International Journal of Advance Technology in Engineering and Science ISSN 2348-7550 Vol.5 Issue 2 February 2017 pp 375-380. "PDCA12-70 data sheet," Opto Speed SA, Mezzovico, Switzerland.

[7]. Dhanraj Patel and Rajesh Verma Analysis of Drilling Tool Life—A Review, International Journal of Mechanical Engineering and Robotics Research.

[8]. N.U. Kakade, Piyush Bhake,Sumit Dandekar ,Rohan Kolte, Sumit Selokar Fabrication of Combine Drilling and Tapping Machine, International Research Journal of Engineering and Technology ISSN: 2395-0072 Vol. 04 Issue 03 Mar -2017 pp 305-307.