

3-Directional Flexible Drilling Machine

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Abstract— 3-Directional drilling machine which can be used based on drilling holes in various location and movement and easily operation done with high accuracy. Productivity can be improved by reducing total machining time and reduced human effort and reduced manufacturing cycle time.

Key words: Drilling machine, Performance, Movement, Material, Operation etc.

machine axis(workmanship perforation). Drilling is operating while producing round holes in the piece work by using a rotating cutter called DRILL.

A Drill is a tool fitted with a cutting tool attachment or driving tool attachment, usually a drill bit or driver bit, used for boring holes in various materials or fastening various materials together with the use of fasteners. The attachment is gripped by a chuck at one end of the drill and rotated while pressed against the target material.

The tip, and sometimes edges, of the cutting tool does the work of cutting into the target material. This may be slicing off thin shavings grinding off small particles crushing and removing pieces of the work piece, countersinking, counter boring, or other operations.

Drills are commonly used in woodworking, metalworking, construction and do-it-yourself projects. Drills are available with a wide variety of performance characteristics, such as power and capacity.

I. INTRODUCTION

A. History:

Around 35,000 BCE, 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 Paleolithic 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. Archeologist discovered a Neolithic grave yard in Mehrgrath, Pakistan dating from the time of the Harappans, around 7,500-9,000 years ago, containing 9 adult bodies with a total of 11 teeth that had been drilled. There are hieroglyphs depicting Egyptian carpenters and bead makers in a tomb at Thebes using bow-drills. The earliest evidence of these tools being used in Egypt dates back to around 2500 BCE. The usage of bow-drills was widely spread through Europe, Africa, Asia and North America, during ancient times and is still used today. Over the years many slight variations of bow and strap drills have developed for the various uses of either boring through materials or lighting fires.

B. General Aspects of Drilling Machine:

Drilling is the operation of producing circular hole in the work-piece by using a rotating cutter called DRILL. The machine used for drilling is called drilling machine. The drilling operation can also be accomplished in lathe, in which the drill is held in tailstock and the work is held by the chuck. The most common drill used is the twist drill.

It is the simplest and accurate machine used in production shop. The work piece is held stationary i.e. Clamped in position and the drill rotates to make a hole.

Drilling machine is kind of machine rotating cutting tool which direction the drill feeds only on the

II. DEVELOPMENT OF DRILLING MACHINE

A. Equipments used for the Experiment as shown:

- Base plate
- Vertical arm
- Horizontal arm
- Suspension spring
- Rollar bearing
- Motor
- Drill bit
- Copper wire
- Switch board
- Guider

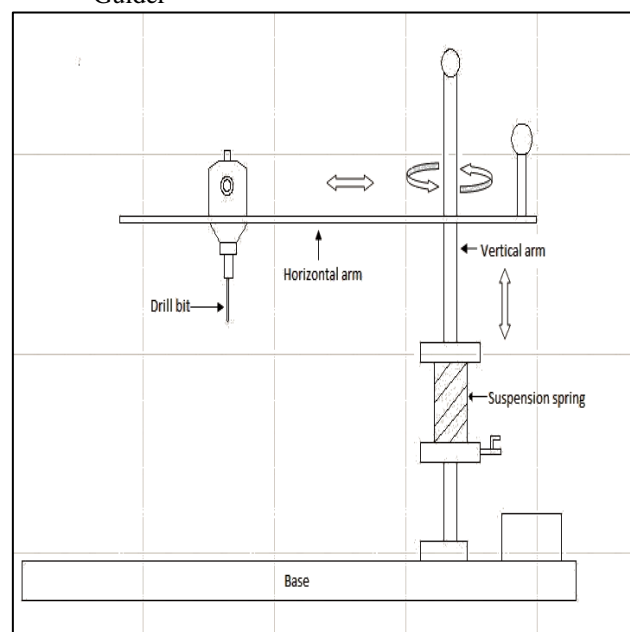


Fig. 1: Experimental Setup Diagram

B. Movements in Flexible Drilling Machine:

This drilling machine possesses a radial arm which along with the drilling head can swing and move vertically up and down as can be seen in Fig. The radial, vertical and horizontal arm movement of the drilling head enables locating the drill spindle at any point within a very large space required by large and odd shaped jobs.

The tubular column on that the radial arm which moves up and down manually or it can powered movement then the drilling head here this is called drilling head which holds the drill spindle here in which the drill is mounted and is subjected to rotation. The entire head is mounted on the radial arm and this can move inward and outward from the drill axis. Also the horizontal arm can slide linearly on vertical arm. Not only that, as this along with this radial arm the drilling head moves upward and downward to have large gap between the to drill and job or there is a stroke length. Not only that further this radial arm can be rotated about the column rotated about the column, say about 360 degree.

The main movements in the machine are:

- 360 degrees rotation of arm joint.
- Up & down movement of the horizontal arm on vertical arm.
- Linear slide movement of horizontal arm.

C. Setup Procedure:

1) Base:

The base acts a support for the whole machine. It's made of a mild steel. 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 larger for the table.

2) Arm:

There are two arms:

- Vertical arm
- Horizontal arm

The primary arm holds the secondary arm and it is with the help of this arm the 360° of rotation is transferred from the t plate to the secondary arm in order to move the drill head at angles. They are made up of stainless steel.

3) Cross Slide:

We have used a hand drilling machine to be fixed on the cross slide. Our drilling machine can drill holes on concrete, wood and metal. The drill bit can be rotated both clockwise and anticlockwise direction.

III. BENEFITS

- Price comparative to other available in market will be much cheaper the presently available smallest radial drilling machine will cost approximately 1.5 lakhs well this machine costs only 40000 rupees.
- The radial, vertical and horizontal movement of the drilling head enables locating the drill spindle at any point within a very large space required by large and odd shaped jobs.
- High accuracy while drilling complex drills can be achieved.
- It is a multifunctional portable machine.

- The sixth degree of freedom is an added advantage of using the machine.
- The machine design on further up gradation is a new step towards evolution of drilling machine would outnumber the presently available model.
- Helping the needy small scale industries had been our motto and we have succeeded in giving a simpler solution which has a huge scope to be improvised in the near future.
- Head may swivel so holes can be drilled on angle
- The flexibility of machining is also one of the main feature of our machine.

IV. CONCLUSION

- The size of machine is smaller than the older machine so it is very simple to move from one place to another. So this machine can be easily transported. The overall space required is also minimum.
- With the help of this machine we can drill holes in any direction at a particular time.
- This machine is reduces the manufacturing cycle time, the re-clamping can be eliminated: once the workpiece is clamped, there is no need for re-clamping in a different direction, reduces the number of machines needed, elimination of human error.
- The machine is very simple to operate.

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