Design of 360 Degree Flexible Drilling Machine

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***Abstract*:-In basic drilling machines, there is a problem of limitation of movement of drilling machine in different directions. Also there are problems of less space between drill bit and job and alignment problems. We can overcome these problems with the help of a 360 degree flexible drilling machine. It can be mounted on a flat surface and can be rotated in any direction-vertical, horizontal, up and down. So that job setting operation is not complicated. the brad point drill bit helps simplify the process while drilling wood. It reduces the setting time for the operation. Materials like wood, plastic and light metals can be drilled with this machine.**

Keywords: Drilling machine, Drill bit, 360 degree

INTRODUCTION

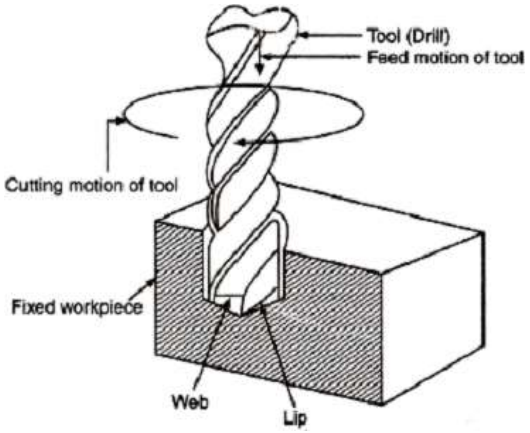
Drilling is a cutting process in which a hole is originated or enlarged by means of a multipoint, fluted, end cutting tool. As the drill is rotated and advanced into the work piece, material is removed in the form of chips that move along fluted shank of drill.

Process characteristics:

1. Uses a multipoint, fluted, end cutting tool
2. Cutting tools are rotated and advanced relative to each other
3. Creates or enlarges no precision holes
4. May produce coarse, helical feed marks, depending on machining parameters
5. Creates small burrs on entry and coarse burrs on exit

PROCESS SCHEMATIC:

Drilling involves relative axial and rotational motions between drill and work piece. Usually the drill rotates and advances into the work piece, but sometimes the opposite is true. Chips are removed by flowing along grooves or flutes in drill. Although long spiral chips usually result from drilling, adjustment of feed rate can result in chips with a range of shapes and sizes.



Drill Bits: Drill bits are cutting tools used to remove material to create holes, almost always of circular cross-section. Drill bits come in many sizes and shapes and can create different kinds of holes in many different materials. In order to create holes drill bits are usually attached to a drill, which powers them to cut through the work piece, typically by rotation. The drill will grasp the upper end of a bit called the shank in the chuck. Drill bits come in standard sizes, described in the drill bit sizes article. A comprehensive drill bit and tap size chart lists metric and imperial sized drill bits alongside the required screw tap sizes. There are also certain specialized drill bits that can create holes with a non-circular cross-section

BRAD POINT DRILL BIT:

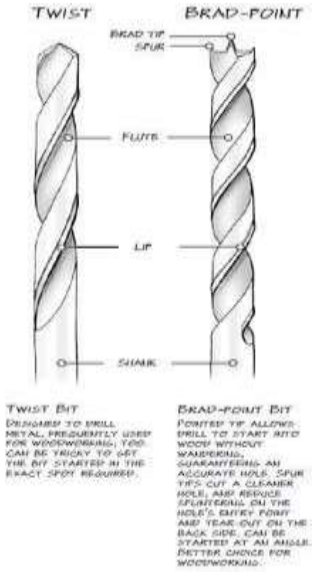
Description: It is also called lip and spur drill bit. It is a variation of the twist drill bit which is optimized for drilling in wood. For metalwork, this is countered by drilling a pilot hole with a spotting drill bit. In wood, the lip and spur drill bit is another solution: The centre of the drill bit is given not the straight chisel of the twist drill bit, but a spur with a sharp point and four sharp corners to cut the wood. The sharp point of the spur simply pushes into the soft wood to keep the drill bit in line.

ADVANTAGES OF BRAD POINT DRILL BIT:

1. An ordinary twist drill bit shears the edges of the hole cleanly. Wood drilled across the grain has long strands of wood fiber. These long strands tend to pull out of the wood hole, rather than being cleanly cut at the hole edge. The lip and spur drill bit has the outside corner of the cutting edges leading, so that it cuts the periphery of the hole before the inner parts of the cutting edges plane off the base of the hole. By cutting the periphery first, the lip maximizes the

chance that the fibers can be cut cleanly, rather than having them pull messily out of the timber.

2. Lip and spur drill bits are also effective in soft plastic. Conventional twist drill bits in a hand drill, where the hole axis is not maintained throughout the operation, have a tendency to smear the edges of the hole through side friction as the drill bit vibrates.
3. Brad point tip provides accurate positioning for starting the hole. Spur cutting edges reduce splintering and ensure a smooth, clean hole.



CONSTRUCTION AND COMPONENTS:

Up/Down and rotating mechanism is available in this Drilling Machine. One end of the arm is attached to a firm base while the other has a tool. These arms are made up of Aluminum. The number of parameters in the subgroup is called the degrees of freedom of the joint. Mechanical linkages are usually designed to transform a given input force and movement into a desired output force and movement.
Motor-It rotates shaft (which is supported by bush) when power is supplied through rectifier. This shaft is connected with drill bit through chuck to rotate drill bit and makes hole on work piece when it is required.
Connecting rod-It connects the two Frames to each other for support between them and to help move when required. It consists of metal strips of two sizes one of 12" (inch) and another is of 15" (inch). Both are of four pieces of equal length.
Pulleys-A set of pulleys are assembled so that they rotate independently on the same axle to form a block. Two blocks with a rope are attached to one of the blocks and threaded through the two sets of pulleys to form a block and tackle.
Bearing-The bearings constrains relative motion to only the desired motion, and reduces friction between moving parts
Screws-A screw joint is a one-degree-of-freedom kinematic pair used in mechanisms. Screw joints provide single-axis translation by utilizing the threads of the threaded rod to provide such translation.

SPECIFICATIONS:

Motor:

Type -DC
Rated voltage-24v
Working voltage-12v
Speed-10000 rpm
Diameter -36mm
Length -57mm
Current- 0.2amp-1.2amp
Power – 2.4watt-15watt
Shaft diameter-3.17mm
Shaft length- 14mm
Material – aluminum
Color- black

Drill chuck:

Outside diameter- 21mm
Clamping range- 0.3mm-4mm
Taper-6mm

Drill bit:

Type-brad point bit
Diameter-3mm
Length -60mm
Material-HSS.

CUTTING PARAMETERS:

A. Cutting Speed (V) :

$V = \pi DN$
N=1750
V=274.88 mm/sec

B. Feed Rate (f) :

40 mm/min

C. Depth of Cut (d) :

d=D/2
d=1.5

D. Material Removal Rate :

$MRR = (\pi D*D/4)f N$
MRR =494800.84

E. Machining Time :

t = L/f

Where, L = length of the hole to be drilled = 100mm
f = feed of the drill = 40 mm/min
t = 2.5 min

F. Torque :

P = 15 watts , N = 1750 rpm
$P = 2\pi NT/60$
$T = P \times 60/2\pi N$
$T = 15 \times 60/2\pi \times 1750$
T = 81.8511 N-mm

CONCLUSION

The 360 degree drilling machine gives effective drilling operation and rotates in 360 degree direction. It is economical and has less handling cost and manufacturing cost. It is highly efficient compared to other units.

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