

# TO DESIGN AND FABRICATE A MACHINE WHICH PERFORMS DRILLING AND SLOTTING OPERATION

*Design and fabricate a machine performs both operation in one machine*

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**Abstract**—The utility model provides a small combined machine tool integrating drilling and slotting operation into one body, which solves the problem that the above two machining operations are respectively independent in the prior art and are performed through two different types of devices with excessive accessories and larger occupation space. There are numerous machine tools, producing round holes, but many components in engineering require square and non-circular holes. In the present day situation, square holes and non-circular holes are produced using CNC Machines or Spark Erosion or Slotting Machines. A quality machine tool to produce square and polygonal holes are rarely available at low cost. This paper aims to help the small scale production floors where a drilling machine exists and the scope of work extends to be done on a slotting machine also. Using this project slots can be cut on work pieces using a drilling machine. This project is an attempt to design and fabricate an attachment for drilling machine which would produce square and polygonal holes much easier than the currently available methods. This is done by using an inversion of the Slider crank mechanism.

**Index terms**--Slotting Machine, Driling Machine, Slider-crank mechanism.

## I. INTRODUCTION

Now we are going to develop combine the drilling and slotting machine for company. In this machine tool holder hold the tools. When drilling is necessary so change the tool and drilling. When slotter is necessary so hold the slotter tool in chuck and you get slotting in work piece. And we are using pulley to transmit the motion. In this machine it is very simple to drilling and slotting so any type of labour can do this work.

There are mainly two machine used.

- (1) Driling machine
- (2) Slotting machine

### (1) Driling Machine

Drilling machine is one of the most important machine tools in a workshop. It was designed to produce a cylindrical hole of required diameter and depth on metal work pieces. Though holes can be made by different machine tools in a shop, drilling machine is designed specifically to perform the operation of drilling and similar operations. Drilling can be done easily at a low cost in a shorter period of time in a drilling machine. Drilling can be called as the operation of producing a cylindrical hole of required diameter and depth by removing metal by the rotating edges of a drill. The cutting tool known as drill is fitted into the spindle of the drilling machine. A mark of indentation is made at the required location with a centre punch. The rotating drill is pressed at the location and is fed into the work. The hole can be made up to a required depth.

### (2) Slotting Machine

It is very useful for making keyways, machining square holes, cutting of internal and external teeth on big gears, machining of dies, punches, etc. The job is generally supported on a round table, which has rotary feed in addition to the usual table movement in cross direction. It is very useful for making keyways, machining square holes, cutting of internal and external teeth on big gears, machining of dies, punches, etc. The job is generally supported on a round table, which has rotary movement in addition to the usual table movement in cross direction. The stroke of slotting machine ranges from 8" to 12". Slotter does not need to have such a large travel of the ram as shaper. The ram can be either crank driven (slotted disc type) or hydraulically driven. Ram speed usually ranges from 2 to 4 m/min in longitudinal and transverse power feed ranges from 0.05 to 2.5mm/stroke. Cutting action takes place in down ward position (stroke).

## II. DESIGN OF THE MACHINE

### (1) SPECIFICATION OF DRILLING MACHINE

- (A) DRILLING CAPACITY:- 20 mm
- (B) DRILL HEAD:-
  - ❖ SPINDLE NOSE MT-4 (with thread)
  - ❖ SPINDLE TRAVEL:- 200 mm
  - ❖ RANGE OF SPINDLE SPEED:- 800-1600 RPM
- (C) TYPE OF FEED:- MANUAL
- (D) POWER:-
  - ❖ DRILLING MOTOR:- 0.5 h.p

(E) WORKING TABLE:-

❖ L\*B\*H:- 230\*300\*150

(F) DIMENSION:-

❖ OVERALL HEIGHT:- 850 mm

## (2) SPECIFICATION OF SLOTTER MACHINE

(A) STROKE LENGTH:- 150 mm

(B) RAM LENGTH:- 300 mm

(C) NO OF STROKE:- 52/minit

(D) ROTARY TABLE:- 230\*300\*150

(E) DISTANCE FROM TOOL TO MAIN COLUMN:- 110 mm

(F) VELOCITY RATIO:-6

## III. CALCULATION

### (1) FOR DRILLING MACHINE

#### (A) PARAMETERS:-

❖ MOTOR SPEED - 1500 RPM

❖ SPINDLE SPEED - 800 RPM

❖ FEED - 0.5 mm

❖ DIAMETER OF DRILL – 5 mm

#### (B) CUTTING SPEED:-

$$= 3.14 * D * N / 1000 \text{ (M/MIN)}$$

$$= 3.14 * 5 * 800 / 1000 \text{ (M/MIN)}$$

$$= 12.56 \text{ (M/MIN)}$$

#### (C) DRILLING TIME:-

$$= L + D / VF$$

$$= 30 + 5 / 1.5$$

$$= 23.33 \text{ SEC}$$

#### (D) MRR:-

$$= (\pi * D / 4) * f$$

$$= (\pi * 5 / 4) * 1.5$$

$$= 5.88 \text{ mm}^3/\text{s}$$

### (2) FOR SLOTTING MACHINING

#### (A) PARAMETERS

❖ No. of strokes = 52 /min

❖ Feed = 2 mm/stroke

❖ L\*w = 5\*5

❖ Motor speed = 1800 rpm

❖ Cutting time return ratio = 1:2

❖  $V = 1 * w (1 + 0.25) / 1000$

$$= 52 * 25 (1 + 0.25) / 1000$$

$$= 1.625 \text{ m/min}$$

❖  $T = w / f * N$

$$= 5 / 2 * 52$$

$$= 2.88 \text{ sec}$$

## IV. WORKING OF THE MACHINE

### (1) Slotting machine

When we perform slotting operation, slotting tool is fitted in tool holder. Motor 2 is provided for slotting operation. There is On-off switch for start & stop of motor. When we start motor, pulley p1 is rotating & it is connected gradually with p2, p3, p4. Pulley P4 is connected with shaft of crank, this shaft is supported by bearing. By rotation of shaft, crank starts rotating. the slotter is connected to slider of the ram, and this slotter moves slider up or down, by using feed table we can move the work piece in x and direction.

### (2) Driling machine

When we perform drilling operation we attach drill chuck into tool holder 0.50 hp motor 1 is used for drilling operation is directly attach with pulley & belt with spindle to provide motion for it. We can change speed to adjust pulley. There is on-off switch for start and stop of the machine. Drilling motor is mounted on wooden plate is resting on ram & fitted with bolts Motor is removable in machine.



Figure 1. (An Attachment of Slotting & Drilling Machine)



Figure 2. (Side View of Slotting & Drilling Machine )

## V. MATERIALS, TOOLS AND PARTS REQUIRED

### (1) PULLEY

Belt performance is highly dependant on pulley performance. High quality pulleys significantly increase belt life and reduce the total cost of ownership of your machinery. Manufactured according to relevant ISO or RMA standards to ensure optimum performance. Statically-balanced to G6.3 balancing quality. Equipped with taper bushes for quick and accurate installation. Phosphate-coated for corrosion resistance. There 5 pulley we are using in our machine to transmit the motion.

MATERIAL: - M.S PROCESS: - CASTING

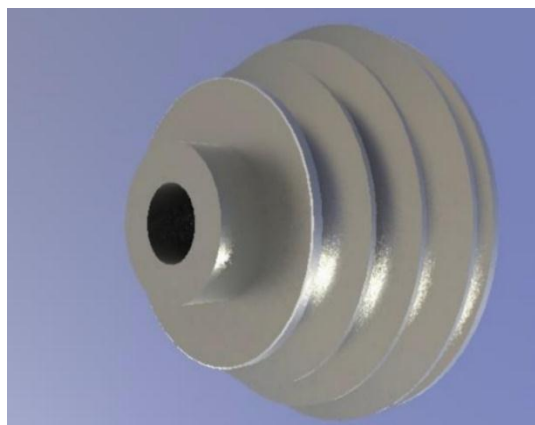


Figure 3. (Pully)

**(2) WORK HOLDING DEVICE (CHUCK)**

The four jaw self-centering chuck, which we used in our machine. Chuck is used to clamp the work piece.

MATERIALS: - CI/CHROMIUM/NICKEL

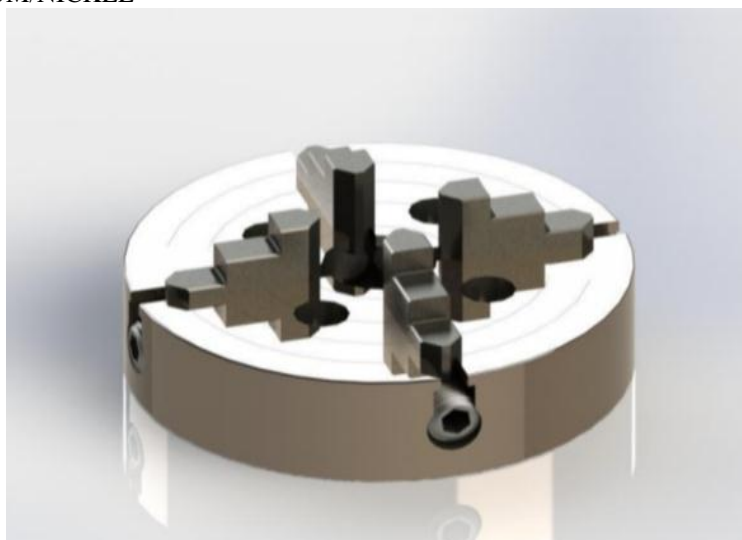


Figure 4.( CHUCK)

**(3) WORK TABLE**

A rotary table is a precision work positioning device used in metalworking. It enables the operator to drill or cut work at exact intervals around a fixed (usually horizontal or vertical) axis. Some rotary tables allow the use of index plates for indexing operations, and some can also be fitted with dividing plates that enable regular work positioning at divisions for which indexing plates are not available. A rotary fixture used in this fashion is more appropriately called a dividing head.

**(4) MOTER**

An electric motor is an electric machine that converts electrical energy into mechanical energy. The reverse conversion of mechanical energy into electrical energy is done by an electric generator. Two electric motors are used in our machine. One used for drilling which having 0.50hp power and other is used for slotting which having 0.75hp power.



Figure 5.(Motor)

**(5) V-BELT**

A well-designed belt drive will transmit power for many years with minimal maintenance. As such, investing in high quality belts reduces the total cost of ownership of your machinery in the long-run.

Benefits: A full analysis of existing drives to ensure the most economical and efficient solutions Drive component and stock rationalization.

**(6) BEARINGS**

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the moving parts of the bearings - the inner and outer part of the bearings. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads.

MATERIALS: -STAINLESS STEEL RING AND CERAMIC BALLS

**(7) RAM**

This is the ram of the machine, which holds the tool. And it moves reciprocate. To reciprocate it in one direction guide ways are provided. This both components are made in shaper machine, in the ram hole is provided to insert a 10mm shaft where our tool is fixed. To guide or support this shaft 2 bearings are provided. And this hole is made in drilling machine. Height of the ram is 310mm

**(8) DRILL BIT**

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 shape and can create different kinds of holes in many different materials. In order to create holes drill bits are 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.



Figure 6. (Drill Bit)

## VI. LITERATURE SURVEY

### (1) Freeman barney

Drilling and slotting molding machine has the advantages of being less in equipment investment. Less labour required. Suitable for carrying out drilling and slotting molding on bamboo chips or timbers due to specific format of machining any join can use this machine easily.

### (2) B.S. Raghuvanshi

The machine has its own importance for accurate operation this is use full helps to provide most economical so far as this kind of work is consred.

### (3) R.MAGUTEESWARAN

In this project they carried out an impressing task in field of industrial workshop. it is very use full for the workers to work in the industrial workshop are in the service station. In the concern there is the reduced cost involved. To perform the entire requirement task which has been provided this project has been designed.

### (4) P. Mayilsamy

An extension of this design gives an option for carrying out slotting operations by varying the stroke length.The operating principle of this machine is very simple, thus making this project a successful one.

## VII. ADVANTAGES OF THE MACHINE

- Drilling and slotting both operations can be performed in a single machine.
- Ease of operation
- It takes lower floor space area.
- Flexibility
- Time reduction
- Cost reduction
- Decrease in material handling

## VIII. PROBLEM SPECIFICATION

The drilling machine is used to make hole in the work piece and slotting machine is used to make slot in the work piece. This two machine is maximum used in the industries in small industries also used this two machine But in the small scale in industries area of the industries is also less so there are two machines is on to be a comfort And price of the drilling and slotting machine is costly. There are small scale industries so budget is less in this situation purchase of two machines is costly for industries.

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