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# FABRICATION OF THREE IN ONE MULTIPURPOSE MECAHNICAL MACHINE USING WHITWORTH MECHANICS.

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## ABSTRACT

The machine is designed for the purpose of multi operation ie., drilling, hacksaw cutting and shaping operation. This machine performs multipurpose operation at their same time with required speed and this machine this automatic which is controlled or operated by motor which is run with help of current.This machine is based on the mechanism of whitworth's quick return. This model of the multi operation machine may be used in industries and operation, which can perform mechanical operation like operation like drilling, cutting and shaping of a thin metallic as well as wooden model or body.

## 1.INTRODUCTION

A multi tool operation machine will do the number of operation alternately in a work piece. A multi tool operation machine has a number of tool heads driven by a single motor.

In this model when the motor will start the power from the motor is transmitted to the driving pulley by driven pulley is connected to the driving pulley by means of v belt .v belt is used when the distance between to pulley is small.

When the power will transmit from motor to the shaft, it is then transmit to the main bevel gear box. Now, when this gear box arrangement will rotate, the all four small spindle or chuck will rotate because this four spindle is

connected to the four small bevel gears. The four tool IN is place on spindle so that we can preformed four operation like drilling.

### MECHANISIM

The Whitworth quick return mechanism converts rotary motion into reciprocating motion, but unlike the crank and slider, the forward reciprocating motion is slower rate than the return stroke. This is why it is called quick return mechanism.

## 1.1PROBLEM DEFINITION

### 1.1.1PROBLEM STATEMENT

To design development of MULTI PURPOSE MECHANICAL MACHINE, a structured which is designed for the purpose of MULTI OPERATIONS i.e. DRILLING, CUTTING & SHAPING.

### 1.1.2 PROBLEM IDENTIFICATION

This machine perform multipurpose operation at the same time with required speed and this machine is automatic which is controlled or operated by motor which is run with help of current. This machine is based on the mechanism of whitworths return.

This model of the multi OPERATIONAL machine is may be used in industries and domestic OPERATION which can perform mechanical operation like drilling, cutting and shaping of a thin metallic as well as wooden model or body.

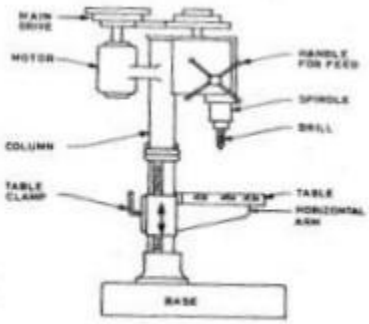
## 1.2COMPONENTS

### 1.2.1COMPONENTS USED

- FRAME
- BEVEL GEAR
- WHITWORTH MECHANISM
- MOTOR
- PULLEY
- BEARING (BALL & SLIDING BEARING)
- ROCKER ARM
- HACKSAW BLADE
- TOOL POST

- DRILLNG CHUCK
- DRILLING TOOL
- SINGLE CUTTING TOOL
- TABLE
- NUT & BOLT
- OTHER COMPONENT

## 3 MACHINE SETUP AND OPERAIONS




## COMPONENT OF MACHINE

**1. SPINDLE**

The spindle holds the drill or cutting tools and revolves fixed position in a sleeve.

**2. 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 its moved upward, the cutting tool is withdrawn from the work.

**3. COLUMN**

The column is cylindrical in shape and built rugged and solid. the column supports the head and the sleeve or quill assembly.

**4. 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.

**5. WORK TABLE**

The work table is supported on an arm mounted to the column. The work table can be adjusted vertically to accommodate different height of work or it can be swung completely out of the way.

**6. BASE**

The base of the drilling machine support 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 work table and may be equipped with t-slot for mounting work too larger for the table.

**7. 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 operator is able to "feel" the action of the cutting tool as it cuts through the work piece.

**8. 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 duty work or the work that uses large drills that require power feed larger work pieces are usually clamped directly to the table or base using t-bolts and clamps by a small work places are held in a vice. A depth- stop mechanism is located on the head, near the spindle, to aid in drilling to a precise depth.

## 3.1 Types of operation

- DRILLING
- SHAPING
- CUTTING

## 3.1 DRILLING

Drilling is the operation of production circular hole in the work-piece by using a rotating cutting 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 tail stock and the work is held by the chuck.
- The most common drill used id the twist drill.

**TABLE 1 SPECIFICATIONS FOR DRILLING OPERATION**

| Drill size in mm | Feed in mm/rev. |
|---|---|
| 3.2&less | 0.025-0.050 |
| 3.2to6.4 | 0.050-0.10 |
| 6.4to12.7 | 0.10-0.18 |
| 12.7to25.4 | 0.18-0.38 |
| 25.4&large | 0.38-0.64 |

## 3.2 SHAPING

The shaping is used to machine flat metal surfaces especially where a large amount of metal has to be removed. Other machines such as milling machines are much more expensive and are more suited to removing smaller amounts of metal of metal, Very accurately.

- The reciprocating motion of the mechanism inside the shaping machine can be seen in the diagram. As the disc rotates the top of the machine moves forward and backward, pushing a cutting tool. The cutting tool removes the metal from work which is carefully bolted down.
- he shaping machine is a simple and yet extremely effective machine. it is used to removes material, usually metals such as steel or aluminium, to produce a flat surface.however, it can also be used to manufacture gears such as rack and pinion systems and other complex shapes. Inside its shell/casing is a crank and slider mechanism that pushes the cutting tool forward and return it to its original position. This motion is continuous.

## 3.3 CUTTING

A hacksaw is a fine tooth saw with a blade held under tension in for cutting materials such as metal or plastics. Hand-held hacksaw consist of a metal arch with a handle, usually a piston grip, with pins for attaching a narrow disposable blade. A screw or other mechanism is used to put the thin blade under tension. The blade can be mounted with the teeth facing toward or away from the handle, resulting in cutting action on either the push or pull stroke. On the push stroke, the arch will flex slight, decreasing the tension on the blade.

| Work piece material | Cutting speed in m/s |
|---|---|
| Mild steel | 0.75 |
| Cast iron | 0.50 |
| Brass/aluminum | 1.5 |
| Bronze | 1.25 |
| Thin section (pipes& tubes) | 1.5 |

**TABLE 1 SPECIFICATIONS FOR CUTTING OPERATION**

## 4.CALCULATIONS

### 4.1 CALCULATION

1.Cutting/shaping Speed

Speed of motor(Nm):2400 rpm

Diameter of pulley A :25mm

Diameter of pulley B :160mm

We have to find out Bull wheel speed(Ns)

We know that,

Ns\Nm=Da/Db

Ns=(Da/Db)*Nm

Ns=(25/160)*2400=375rmp

Bull Wheel speed(Ns)=375rmp

1 stroke of ram is completed in 1 revolution of crank wheel.

K=1

Velocity of sawing/Shaping Machine;

Velocity(v)={L*N*(1+K)}/1000m/min

Length of Ram stroke(L)=50mm

Number of Full stroke(N)=200stroke/min

Ratio of return time to cutting time(K)=1

Hence,

V={L*N*(1+K)}/1000

V={50*200*(1+1)}/1000,V=20m/min

Therefore, velocity or Ram(Cutting/shaping) is 20m/min.

2. Drilling Speed:

Speed of Pinion (Np): 375rpm

No. of teeth pinion (Tp): 10

No. of teeth Gear (tg) : 18

We have to find out speed of gear (Ng)

We know that,

- Ng/Np=Tp/Tg
- Ng=(Np/Tg)
- Ng=(10/18)*375=208 rpm

Therefore, drilling speed is 208 rpm.

## ADVANTAGES

- Multi operation are performed at one time .
- Our machine is used in return stroke mechanism also.
- The return stroke of shaper machine is utilized as cutting operation.
- All operation is performed in single motor.
- Time saving.
- Less man power is required.

## 5.CONCLUSION

By using that machine we can perform multiple operations at the same time time consumption of the experiment is less compared to other type conventional process. in future the improvements maybe done in that machine it may used in many of the industrial applications

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