

MULTI FUNCTIONAL TOOL HANDLING EQUIPMENT

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ABSTRACT

Drilling, Tapping, Grinding & Cutting are the important machining process performed in different machines. This remains difficulties in investment and occupies more space. In this paper by carrying out extensive literature review, difficulties faced by machine handlers and small scale industrial founder has been analyzed. For that an new machine design is suggested which can perform all the above machining process with same precision.

Keywords: Drilling, Tapping, Grinding & Cutting

I. INTRODUCTION

Multi functional tool handling equipment as a research area is motivated by questions that arise in industrial manufacturing. This analysis represents the combination of Four operation with single handling machine. This Equipment consists of chuck were all kind of machining tool can be hold and perform. Operation tools are "Drilling, Tapping, Cutting and Grinding". Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. Tapping is an internal thread cutting process which is used to make thread as nut. Angle grinders are versatile tools that can grind metal and cut tile, stucco and pavers, make quick work of rust & loose paint removal, sharpen blades and cut or grind steel. The Cutting action is performed by an abrasive disc similar to a this grinding wheel is call abrasive disc similar to a thin to cut hard materials, such as metals, wood, tile and concrete.

II. CONSTRUCTION

A. Review Stage:

Design of hand drilling machine is changed as per the requirement to hold all type of machining like Drilling, Tapping, Cutting, and Grinding.

i. Drilling:

Drilling is the process of producing circular hole in the work piece by using a rotating cutter called drill. The machine used for drilling is called drilling machine.

Types of Drill:

- Twist Drill
- Step Drill
- Core Drill

Drill tool main parts:

- Shank
- Body
- Point

1. Shank:

The **shank** is the end of a **drill** bit grasped by the chuck of a **drill**. The cutting edges of the **drill** bit contact the work piece, and are connected via the shaft with the **shank**, which fits into the chuck.

A. Straight-shank drills:

- Held in drill chuck
- Up to ½ inch diameter



B. Tapered -shank drills:

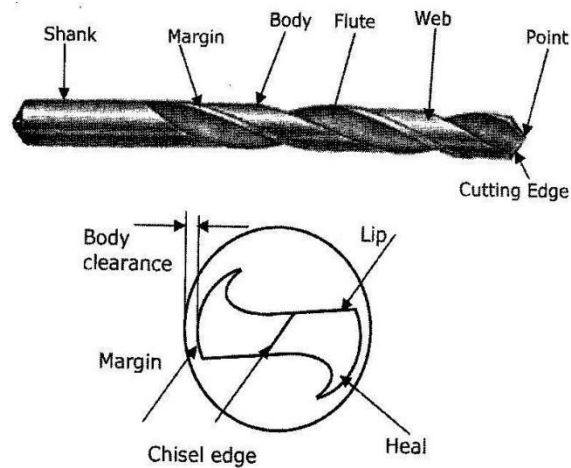
- Fit into internal taper of drill press spindle.
- Tang provided on end to prevent drill from slipping.



2. Body:

- Portion of drill between shank and point.
- Consist of number of parts for cutting.

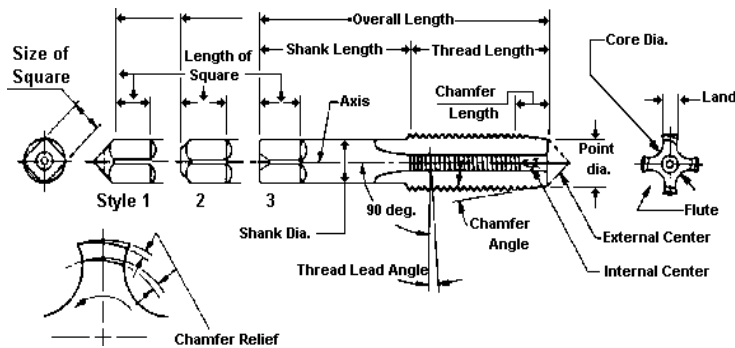
3. Point:



ii. Taping:

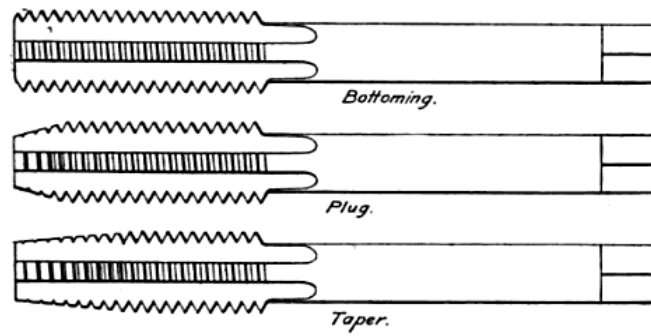
Taping is the process of cutting a thread inside a hole so that a cap screw or bolt can be thread into the hole. Also, it is used to make thread on nuts.

Tap Terminology:



Hand Tap:

- Bottoming tap or plug tap
- Intermediate tap, second tap, or plug tap
- Taper tap



Machine Tap:



❖ Spiralpoint



❖ Spiralflute



Flute less

Taping Formula:

$$\text{RPM} = (\text{SFM} \times 3.82) \text{ divided by } D \quad \text{SFM} = (3.14 \times D \times \text{RPM}) \text{ divided by } 12$$

Where:

D = Diameter of Tap in inches.

Tapping speeds should be DECREASED if

- Lubricant is poor or flow is restricted.
- Bottom lead or Spiral flute taps are used.
- Thread depth (%) increase.
- Thread pitch is course.
- Cutting taper threads (50% Normal Speed)

Tapping speeds can be INCREASED if

- Thread depth decreases.
- Thread pitch is fine.
- Coolant flow and quality is good.
- Spiral point taps are used.

iii. Grinding:

Grinding is a metal cutting operation performed by means of abrasive particles mounted on a rotating wheel. Each of the particles act as a single point cutting tool and grinding wheel act as a multi point cutting tool. Grinding is one of the widely accepted finishing operations and it removes material in very small size of chips 0.23 to 0.50mm. It provides accuracy of the order of 0.000025mm. Grinding of very hard material is also possible.

Types of Grinding:

- Cylindrical Grinding
- Centre less Grinding
- Internal Grinding
- Surface Grinding
- Tool and cutter Grinding

Types of Grinding Wheel:

- Cup Wheel
- Straight Wheel
- Cylinder Wheel

- Tapered Wheel
- Straight Wheel
- Dish Cup
- Saucer Wheel
- Diamond Wheel
- Diamond Mandrels
- Cut off Wheel



iv. Cutting:

Cutting tool is used to remove material from the work piece by means of shear deformation. Cutting tool is a operation of various process in which a piece of raw material is cut into a desired finite shape.



Cutting tool process:

Cutting tool is the operation of various processes in which a piece of raw material is cut into a desired final shape and size by a controlled material-removal process and controlled material removal in cutting process materials must be harder than the material which is to be cut, and the tool must be able to withstand the heat generated in the metal-cutting process. Also, the tool must have a specific geometry, with clearance angles designed so that the cutting edge can contact the work piece without the rest of the tool dragging on the work piece surface. The angle of the cutting face is also important, as is the flute width, number of flutes or teeth, and margin size. In order to have a long working life, all of the above must



be optimized, plus the speeds and feeds at which the tool is run. [4] discussed about a disclosure

which is made regarding a gear blocking gear cover for the four wheeler vehicle where the protective cover has been with touch sensors and biometric sensors. Here in case of theft even if the car is started without a key the gear system is locked using biometric locks which can read the palm of the user to unlock the gear system thus protecting the vehicle against any form of theft. This device can be attached to any type of four wheeler vehicle.

Types of cutting tools:



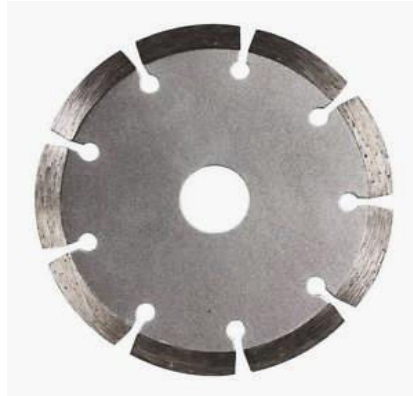
➤ **Metal cuttingwheel:**

The main considerations in using resinoid bonded wheels include the cutting application, the tool being used

such as a right-angle grinder, die grinder, or chop saw desired cutting action, the material being cut, and space. Wheels typically provide a fast cutting action, long life, and tend to be cost-effective The most popular range is 2 to 16 inches in diameter, and common thicknesses are from 0.045 in. to 1/8 in. Thinner wheels remove less material during the cut.

➤ **Diamond blade:**

Diamond blade is a cutting tool which has exposed diamond particles captured in a metal matrix each with a small cutting edge. Diamond blades are usually made with a steel core or completely impregnated with diamond. During the diamond cutting operation, the surface speed may reach 30 m/sec, if using a high speed diamond cutting saw The cutting action is performed by accumulation of small chips scratched out by the numerous diamond particles impeded in the bond.



Cutting process:

Cutting is a collection of processes wherein material is brought to a specified geometry by removing excess material using various kinds of tooling to leave a finished part that meets specifications. The net result of cutting is two products, the waste or excess material, and the finished part. In woodworking, the waste would be sawdust and excess wood. In cutting metals the waste is chips or swarf and excess metal. [2] discussed about a disclosure which is made regarding a driving alert system which is designed in the form of a neck cushion which has the capability to sense the posture of the drivers neck position so as to identify whether the driver is alert and if he is dozing of. The system is made intelligent to obtain data from the movement so as to produce triggers to alert the user and to keep him/her awake to avoid accidents. The system is also linked to a mobile computing device so as to provide a report of the analysis done. The drivers location can also be tracked using the same.

III.MACHINE SPECIFICATION

Drilling:

Drilling Diameter (in mm): **10 mm, 13 mm** No Load Speed (in rpm): **1800-3200rpm** Reverse

Rotation: **Yes**

Item Weight (in Kgs): **3 Kg**

Is It Variable Speed: **Non Variable Speed**

voltage: **110v/230v.**

Power: **280w**

Loaded speed: **0-600rpm** Drilling capacity: **10mm** Chuck capacity: **0.8-**

10mm. Torque setting: **24 shifts**

Tapping:

$RPM = (SFM \times 3.82) \text{ divided by } D$

$SFM = (3.14 \times D \times RPM) \text{ divided by } 12$

Cutting & Grinding:

Disc Diameter: **4 inch**

Power Consumption: **670W** Usage/Application: **Grinding and Cutting** Lock On-Off Switch:

Yes

Type Of Power Tool:**Electrical**

III.MACHINE DESIGN



IV TOOL DESIGN

1. DrillingTool:



2. Tapping Tool:



3. Cutting & Grinding Tool:



CONCLUSION

This machine is designed which can perform all the above machining process in same precision with advance Handling Mechanism. Also easy going with simple maintenance & manufacturing.

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