



Design And Manufacturing Of Gear Shaping And Honing Machine

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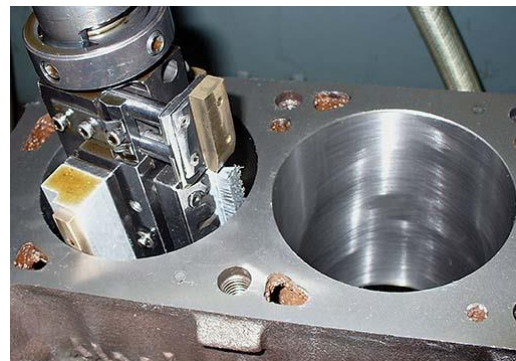
Abstract: In the machining industry, there is a constant need to increase productivity while also maintaining dimensional tolerances and good surface quality. For many classical machining operations (e.g. milling, turning, and broaching), research has been established that is able to predict the part quality based on process parameters, workpiece material, and the machine's dynamic characteristics. This allows process planners to design their programs virtually to maximize productivity while meeting the specified part quality.

Gear shaping is one of the most prominent methods of machining cylindrical gears. More specifically, it is the most prominent method for generating internal gears which are a major component in planetary gear boxes. The gear shaping process uses a modified external gear as a cutting tool which reciprocates up and down to cut the teeth in the work piece. Simultaneously, the tool and work piece are also rotating proportionally to their gear ratio which emulate the rolling of two gears. During the beginning of each gear shaping pass, the tool is radially fed into the work piece until the desired depth of cut is reached. In this study, the three kinematic components (reciprocating feed, rotary feed, and radial feed) are mathematically

I. INTRODUCTION

Gear shaping is one of the prominent methods of manufacturing cylindrical gears. it is a generating process which uses a modified cylindrical gear as a tool that axially reciprocates up and down to cut the teeth in the workpiece .the cutter and workpiece continuously rotate during the cutting action which simulate the rolling of two gears and, at the beginning of the process, the cutter is radially fed into the workpiece until it reaches the final depth of cut. compared to gear hobbing (which uses a worm gear cutter), gear shaping is generally not as productive, however is more versatile

For example, gear hobbing is unable to generate internal gears or gears with geometric constraints which would interfere with a gear hob. Furthermore, gear shaping may be used as a finishing operation of hardened gears . Therefore, it is important to have an understanding of the physics of the operation to improve productivity and the quality of the machined gears.



Honing Is An Abrasive Machining Process That Machines A Precision Surface On A Metal Work Piece By Scrubbing An Abrasive Stone Against It Along A Controlled Path. The Honing Stones Are Held against the Work piece With Controlled Light Pressure. It Is Desired That The Honing Stones Should Not Leave The Work Surface. Honing Process Is Primarily Used To Improve The Geometric Form Of A Surface And Also Improves Surface Texture. The Surface Finish Has A Vital Influence On Most Important Functional Properties Such As Fatigue Strength, Wear Resistance, Power Losses Due To Friction And Corrosion Resistance. It Is A One Type Of Finishing Operation Employed Not Only To Produce High Finish But Also To Correct Out-Of-Roundness, Axial Distortion And Taper In Work pieces.

It Is Employed Very Frequently For Finishing Of Bores. There Are Numerous External Surfaces Which Are Honed To Obtain Required Properties Or Gear Teeth, Valve Seating, Races Of Ball And Roller Bearings Etc. Honing Stones Also Called Honing Sticks Which Consists Of Particles Of Aluminum Oxide, Silicon Carbide Or Diamond Bonded Together With Vitrified Clay, Cork, Carbon, Metal Or Resinoid. The Abrasive Particles Which Provide The Cutting Action Must Be Able To Withstand The Cutting Pressure Required For The Metal Removal. The Bond Must Be Strong Enough To Hold the Grit, But It Must Not Be So Hard As To Rub The Work piece And Retard Cutting. The Porosity Of The Structure Of The Stick Is Depending On The Mixture Of Grit And Bond. The Method And Pressure Used In Forming The Sticks, Facilitates Chip Clearance, Thereby Minimizing The Generation Of Heat. The Size Of The Grit Ranges From 36-600 But The Most Widely Used Size Ranges In Between 120-320. Selection Of A Particular Grit Size Depends Mainly On The Desired Rate Of Material Removal And The Required Finish. Coarse Grit Removes Material As Fast As Possible But Result Comes Out As Rougher Finish.

2.Working:

There Is Rotating, Reciprocating, and Combine Moment Are There In A Machine, For the Rotating Motion We Have To Unlock The lock Pin from the tool holder. And then turn on the switch the rotating moment in clockwise and anticlockwise direction of moment must be seen. From the rotating moment of cutting tool such operations Like, drilling, boring, counter boring, reaming are done by rotating motion of cutting tool. when the switch is turn on the cutting tool is reciprocate Vertically up and down motion of the cutting tool must be seen, from the reciprocating motion of the cutting tool The vertical slots, gear manufacturing, inverted t-slots, etc. are done and if both up-down and rotating motion given to the honing tool then honing operation can be easily done.

This machine is versatile machine with use of this machine drilling, boring, counter boring, reaming, honing operation, vertical slots, gear manufacturing, inverted t-slots etc operation can be done . For the above operation perform only need to change cutting tool according to operation . So this machine is very useful in all production industries.

Advantages

- Only one cutter is used to produce all gears of one module.
- Profile tooth is more accurate.
- The rate of production is faster.
- Different types of gears can be made except worm and worm wheels.
- Accuracy and repeatability of the gear tooth profile can be maintained comfortably.

Disadvantages

- Impossible to improve lack of straightness in holes.
- Amount of stock removal is less.
- Special helical guides are required for cutting helical gears.
- Worms & Worm wheels cannot be generated on gear shapers.
- The rate of production is lower than the gear hobbing process due to periodical indexing hence More machining time.

Implementation

Basic components of gear shaping and honing machine is given below.



fig 1.1 motor

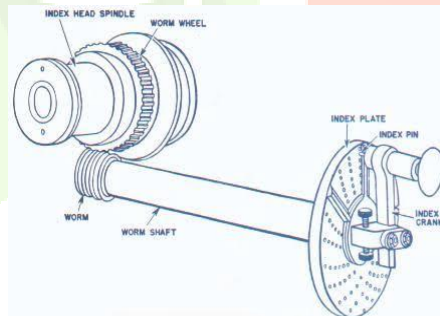


fig 1.2 indexing plate



fig 1.3. Pulley



Fig 1.4 Honing tool

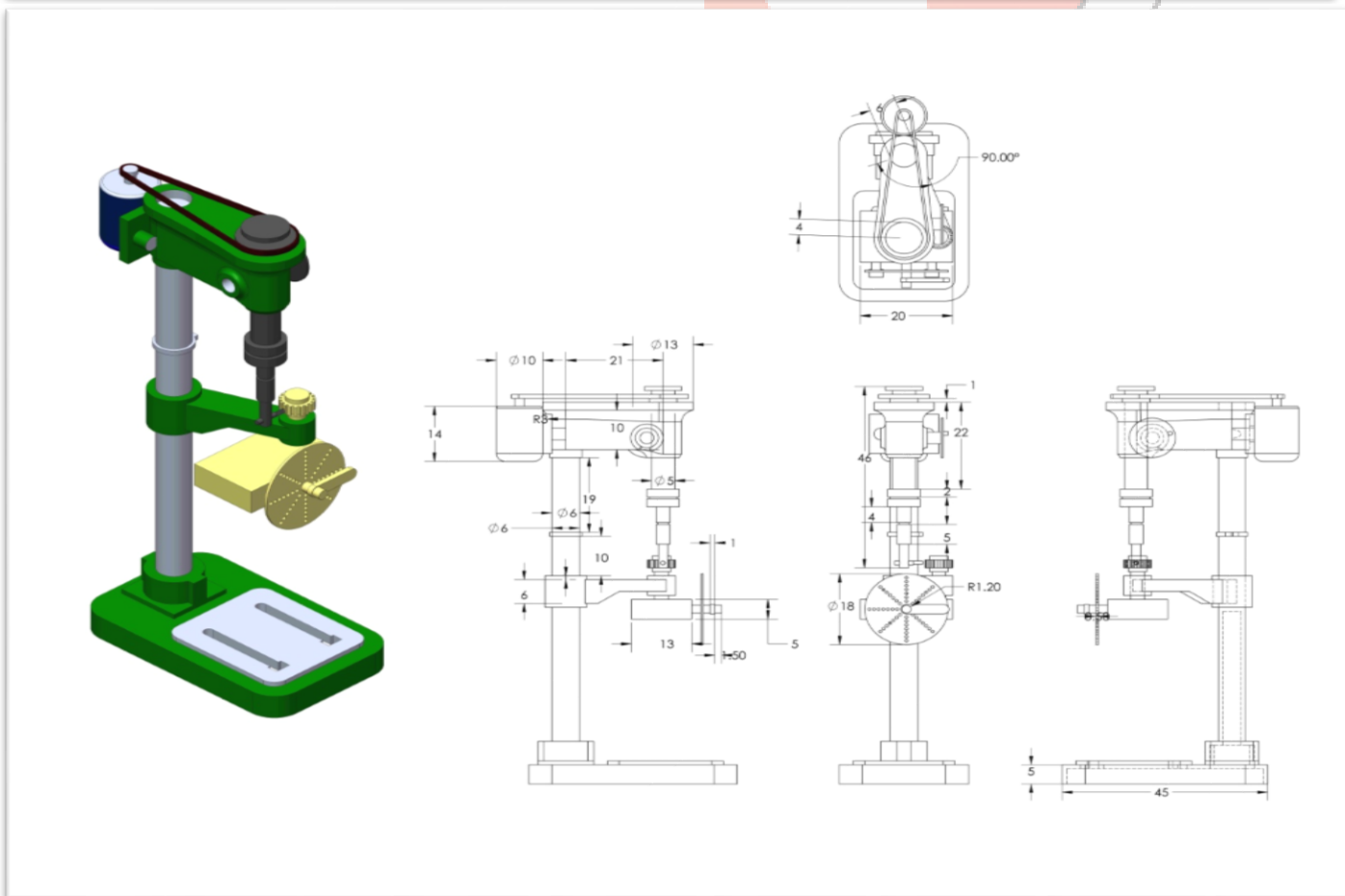
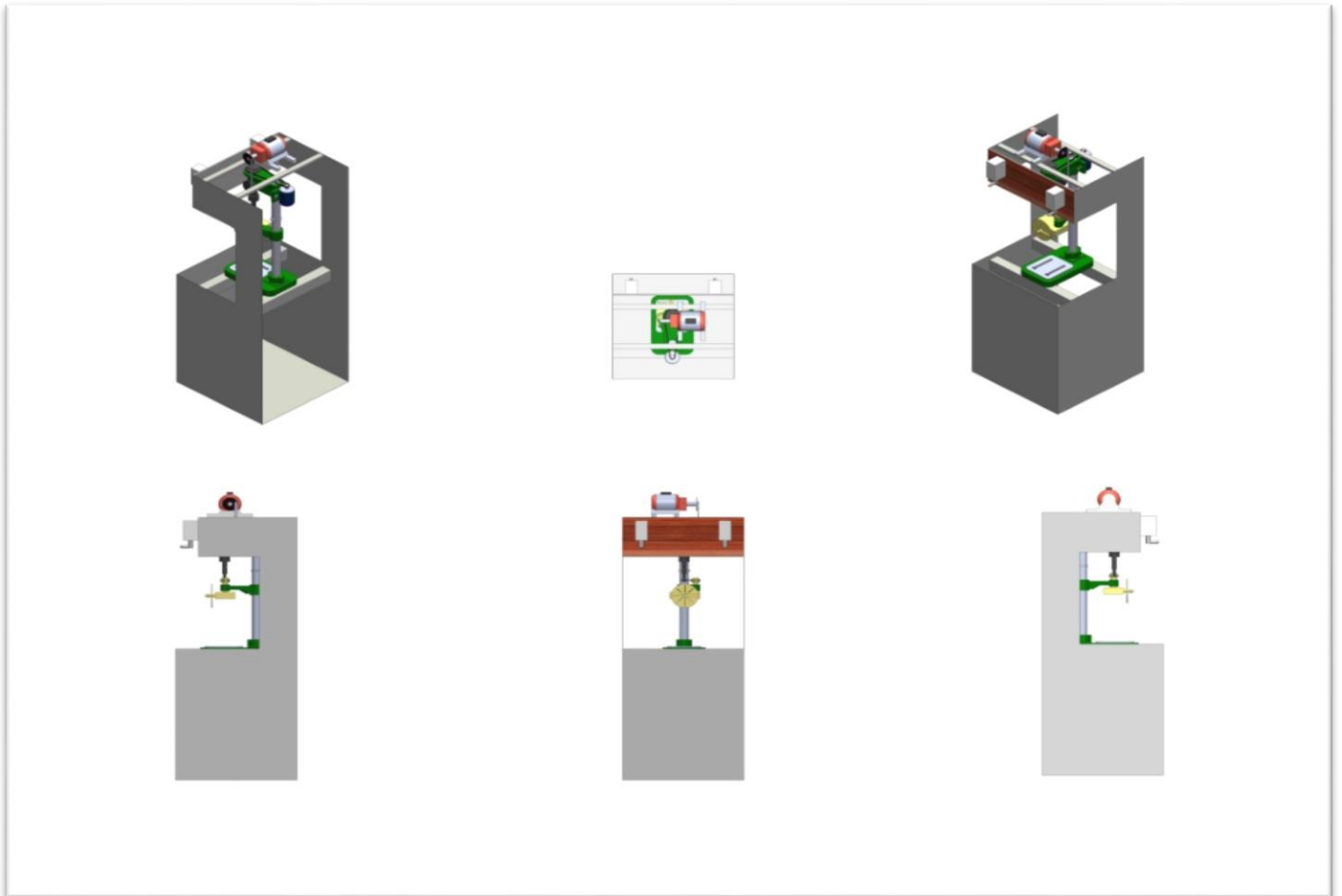


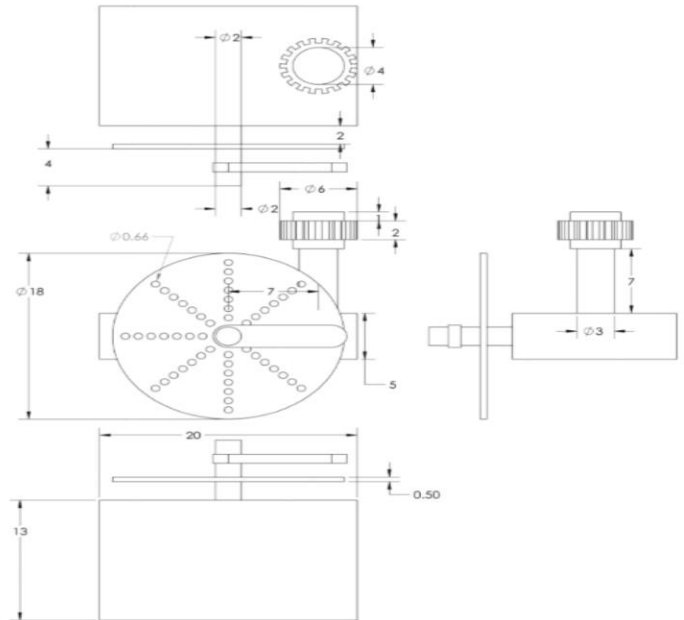
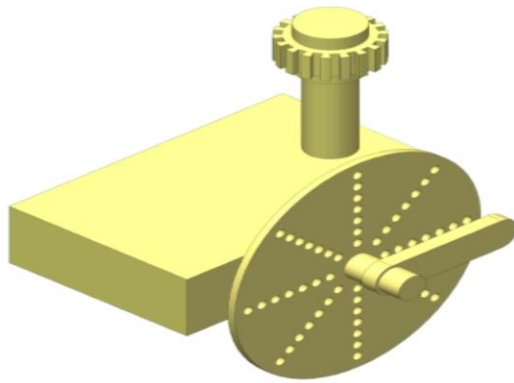
fig 1.5 master gear cutter



fig 1.6 Boring tool

Figures:





Problem Statement

- To find motor as per our requirement.
- Gear teeth not cut properly during the operation
- While perform honing operation to face the problem of decrease the cutting speed and feed , so we need separate gear box.
- To rotate work table as per indexing method.

Processed Application

- Used In Gear Manufacturing Industries.
- Cutting spur gears, Splines, slots , inverted T-slots
- Honing operation can be done for cylinder.
- Drilling , boring , reaming can be done

Conclusion: Through this project the manufacturing of spur gears using forming tools was learned. The problems that could rise when making a gear. After complete assembly of the system trial is taken on the machine and it is found that the system gave satisfactory performance and all previous difficulties have been resolved. This modified machine system for honing operation reduces the time delay and cost existing with the former practice. This modified machine system for operation is reduces the time delay, reduce tool changing time, reduce vibration and cost existing with the former practice .

ACKNOWLEDGMENT

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