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DESIGN AND FABRICATION OF PORTABLE DRILLING AND BORING MACHINE

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Abstract : *In India, the growth of manufacturing depends largely on its productivity. Productivity depends upon many factors, one of the major factors are the portability and compactness along with the manufacturing efficiency with which the operations are carried out in the industry. Productivity can be improved by automation of machines and combining the different operations in a single machine etc. Drilling and boring are the major processes involves in manufacturing of most of the industrial as well as commercial products. In the large scale industry for performing the drilling and boring operations special, heavy duty machines are used but the down side of this machines are high initial as well as maintenance cost, large space, skilled workers etc. However, in case of small scale industry the scenario is completely different, because of lack of space, low capital investment, unskilled workers etc. they cannot afford heavy duty machines. In This paper, a system is proposed to simplify a drilling and boring operation by using a gear system and a simple mechanism incorporate in a single machine. The aim of this paper is to generate a new concept to combine and perform drilling and boring operation effectively and efficiently.*

Keywords – *Portable, Drilling, Boring, Automation*

I. INTRODUCTION

This paper discusses the design and fabrication of portable drilling and boring machine. In today's manufacturing industry both drilling and boring process shares high percentage in fabrication of industrial as well as commercial products. In case of large scale industry special purpose and heavy duty machines are used for drilling and boring but these machines are costly and require large space and difficult to transport from one place to another. Therefore it is necessary to provide portable, compact and cost effective machine which can do both drilling and boring operations for small scale industry which cannot afford heavy duty machines due to low capital investment and small space available. One way to achieve this is by using gear system and simple mechanism incorporate with drilling machine which can perform drilling when needed and by engaging gear system it will perform boring operation with same machine.

Time saved due to portability of machine causes increase in productivity, less human intervention, indirectly reduction in manpower, Increase the profit of industry. This is new approach to increase the productivity of an organization. If we compare between conventional machine and portable and compact machine in terms of time, costs, number of steps involved, etc., the portable and compact machine is preferred choice.

II. LITERATURE REVIEW

K.N. Shi et.al, 2019[1] conducted a study on how energy efficiency is affected by tool geometry. They study different geometrical parameters i.e. cutter radius, flute numbers, helix angle etc. In this study they do both experimental as well as theoretical study on milling cutter geometry. This helps us in selecting appropriate cutting tool.

G. Prasanth Kumar et.al, 2018 [2] presented a paper which comprise new 360 degree drill machine design. This drill can be mounted on wall or table and can do drilling operation vertically, horizontally or even upside down. In many components drilling is not easy because small work space between drill bit and work space. So this propose design make it possible for easy drilling in complicated parts and surfaces.

Alexander Szyszko, 2015 [3] conducted a study on improvements of rotary screen printers with the help of stepper motor for indexing the screen printer. The stepper motor also have a controlled acceleration and deceleration speed while it indexes. The motor further drives spur gear with control reduction ratio which is needed in this operation.

Indraneel Chakraborty et. al, 2003 [4] presented a paper which comprise a genetic algorithms for solving the problems related to calculation of bearing parameters in a effective way for beginners as well as student engineers because many bearing manufacturing companies not publish real design aspects. This study helps us for selecting or calculating required bearing parameters.

Thomas Ulinskas, 1992 [5] presented a study on a fixture for accurately boring a hole in a workpiece which comprises a base member and a clamping means for mounting the fixture on top of the workpiece. A guide block is mounted in the base member for movement along a path extending across a surface of the workpiece.

Werner Sassmannshausen et.al, 1996 [6] developed a stand or tripod stand which used to hold musical instruments and accessories. Stand contains adjustable legs which are slid ably mounted on center shaft wherein at least one leg can swung around center shaft. This paper helps to design of adjustable legs for entire model.

G Madhusudan, C.R. Vijayasimha, 1987 [7] presented a paper which oriented towards training and education aspects of gear design process. In this paper they try to develop computer program which is capable to design required gear design .This is helpful in designing or selecting required gear.

Masaaki Miyanaga, 1983 [8] conducted a study relates to a tool for boring or drilling holes in relatively hard, thick material such as sheet steel. The borer includes a tubular, cylindrical part having cutting teeth on one end edge. This helps in selecting required cutter for required metal removing operation.

III. PROBLEM DEFINITION

3.1 Problem Statement

In a manufacturing industry drilling and boring are the major processes. However, it is known that drilling and boring operations require heavy machinery, heavy fixtures, skilled workers, etc. Also, the small workshops like garages cannot afford such costly machines due to lack of space and money.

3.2 Objectives:

a) To make compact and portable machine for ease of drilling and boring.
b) To eliminate need of variety of drill bit size.
c) To provide efficient and cost effective machine for small workshops.

IV. PROPOSED METHODOLOGY

As we see many problems related to boring operation in the above chapters, we trying to build a machine which can do boring as well as drilling operations conveniently. After collecting and compiling data we reached the following methodology.

The following process chart of methodology shows the flow of the process of fabrication of the working model.

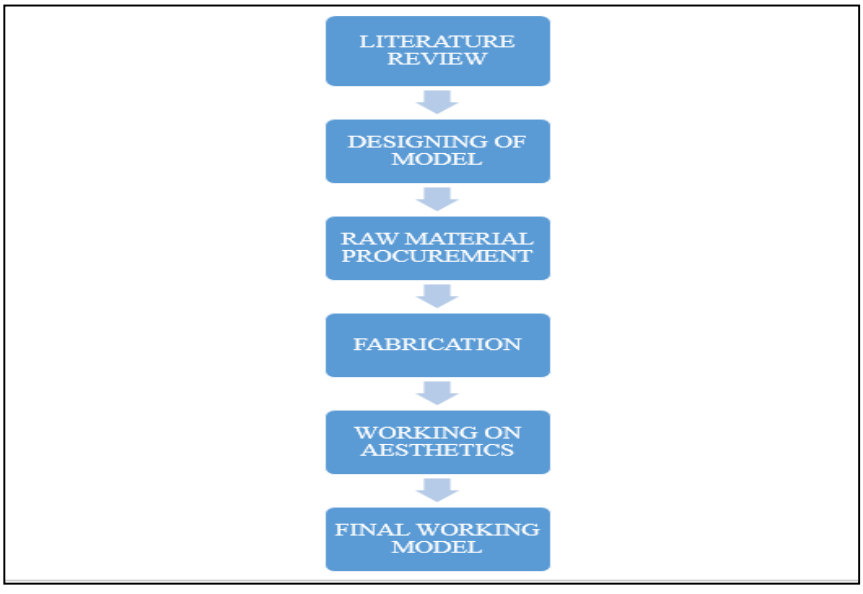

Fig.4.1: Process Chart of Methodology

4.1 Literature review

In this part we refer some papers regarding to drilling and boring operations and also the components required in working model and collect particular information from that all papers which is helpful in designing and manufacturing this project model.

4.2 Designing of Model

Designing play important role in any project work. Based on theoretical assumptions and certain assumed data we build CAD model in solid works. After modeling is done we go for checking of all mating components are working or not.

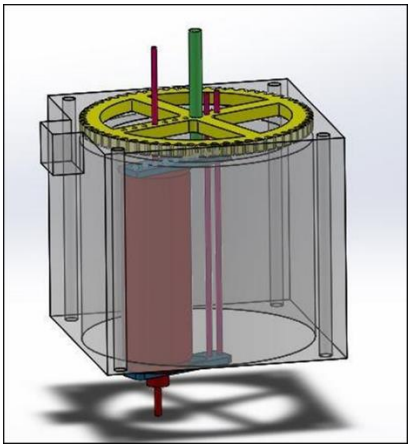

Fig.4.2: Project Model

4.3 Raw Material Procurement

In every product, material plays important role. Raw material procurement is done along with the designing of CAD model which helps in reduction of overall time which is used in fabrication of model. Selection of material for metal sheets of body of a model, lubrication material and stepper motor is done.

TABLE 4.1: Part List

PART NAME	MATERIAL	QUANTITY	COST (Rs.)
Stepper motor	-	1	1500
Shaft/rod	Mild Steel	1	300
Connecting rods	Mild steel	4	300
Plates	Structural steel	2	200
Drill Machine	-	1	2000
Drill bit	HSS	2	200
Milling cutter	HSS	1	800
Bearing	-	3	800
Body	Sheet metal	1	-
Feeding mechanism	-	1	-
Table	-	1	500
Stand rods	Structural steel	4	300
Gear	Steel	1	1000

4.4 Fabrication

As we found out proper working model from design phase then it represents on A3 size sheet for reference. By using this we fabricate miniature for visual inspection. As material is selected we buy side by side in designing phase and after that manufacturing is begin.

4.5 Working on Aesthetics

After manufacturing we work on making good looking outer casing and done some paint job on model.

V. CONCLUSION

By using the portable drilling and boring machine we can make drilling and boring process easier and this process is economic. Hence expecting the results while using portable drilling and boring machine are listed below:

1. Make compact and portable machine for ease of drilling and boring.
2. Eliminate need of variety of drill bit size.
3. Provide efficient and cost effective machine for small workshops.

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