iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** V **Month of publication:** May 2018

DOI: http://doi.org/10.22214/ijraset.2018.5192

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue V, May 2018- Available at www.ijraset.com

Design and Fabrication of Combined Drilling and Boring Machine

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Abstract: This paper deals with Design and Fabrication of Combine Drilling and boring Machine. In the present market the combined drilling cum Boring machine is not available. For Boring we need either a manual process or a Boring attached in a drilling machine. We provided a boring attachment in drilling machine for multi operation in a single pass.

Keywords:
1) Drilling
2) Borin
3) Boring attachment
4) Single-pass, multi operation.

I. INTRODUCTION

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work piece, cutting off chips from the hole as it is drilled. In machining, boring is the process of enlarging a hole that has already been drilled (or cast) by means of a boring cutting tool, such as in boring a gun barrel or an engine cylinder.

Boring is used to achieve greater accuracy of the diameter of a hole, and can be used to cut a tapered hole. Boring can be viewed as the internal-diameter counterpart to turning, which cuts external diameters. In combine drilling and boring machine both the drilling and boring operations are done in a single phase. This is used for mass production, a great time saver where many pieces of jobs having many holes are to be drilled. It can used in mechanical industry in order to increase the productivity of machining systems.

In today's market the customer demands the product of right quality, right quantity, right cost, & at right time. Therefore it is necessary to improve productivity as well as quality. One way to achieve this is by using combine machine. On the other hand, in order to meet quality requirements of final product.

II. COMPONENTS

A. Motor

It is a 1 Phase 0.12 H.P. Motor and runs at 2800 rpm & is mounted on the top. A motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this would be the conversion of mechanical energy into electrical energy & is done by an electrical generator. This are used to produce linear or rotary force & should be distinguished from devices such as magnetic solenoids & loud speakers.

B. Base

The Base is that part of the machine on which the vertical column is mounted. The Base is made of Cast Iron. It serves as a foundation member for all other parts which rests upon it.

C. Column

The column is the vertical member of the machine, which supports the table and the head containing all the driving mechanism. The Column should sufficiently, rigid so that it can take up the entire cutting pressure.

D. Table

The Table is mounted on the column and use for clamping the work directly on its face. The table is made as a rectangular in shape. The table moves up and down over the column of the machine. The top of the table is machined and is used for holding work pieces. It is made of Cast Iron.

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E. Main Vertical Spindle

Spindle is mounted vertically, held between bushes and its end are connected to the spindle which is attached to the drill Chuck to hold the tool. The spindle rotates in the either direction according to the rotation of a motor.

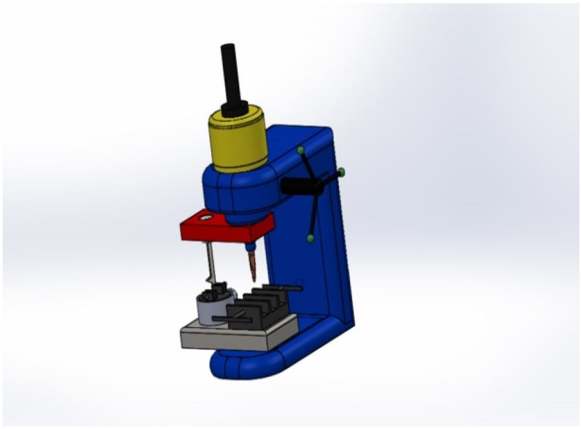
F .Drill Chuck

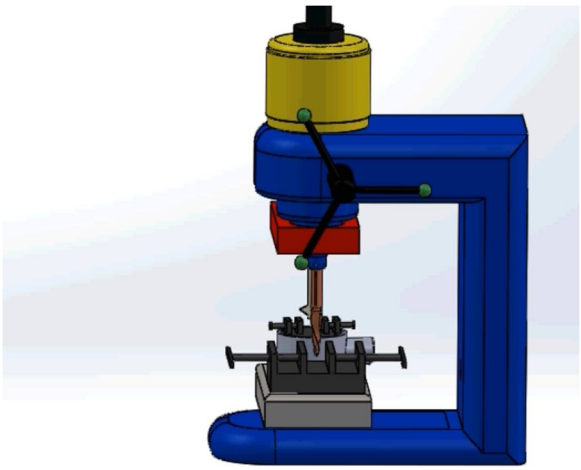
The self- centering 3 jaw chuck is particularly adapted for holding tools having straight shanks. The chuck is tightened and loosened by rotating a bevel key meshed with bevel teeth of the sleeve. The drilling chuck is in the range between of 0.6 to 6.5mm and boring operation chuck is in between of 1.5 to 10mm.

G .Wiper Motor

Wiper motor is use for the rotating movement of workpiece table for the boring operation and of 12v dc motor and rotates at 60 rpm.

III. DESIGN





IV. WORKING

In this project we design the boring operation attachment in drilling machine. In this project we made one machine in which two processes drilling and boring are done together. In which one plate is in rotating condition and another one in stationary condition. In that during drilling operation drilling chuck is in rotating condition and workpiece in stationary condition and for boring operation tool in stationary condition and workpiece plate in rotating condition by means of wiper motor. The vertical up-down movement of the dtilling and boring tool is given by the rack and pinion mechanism. The drilling process is activated using a multi-point cutting tool called “Drill”. The Drill is held in the main spindle by a collate Chuck / Drill Chuck. The Spindle gets its drive power from the motor. The travel of the “Drill” over the entire thickness of the work piece is achieved by the movement of the Rack

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and Pinion. The spindle speed requires for the Drilling operation is around 2800 rpm. The boring operation is done using a single point cutting tool. The tool is held in the chuck and its remain in stationary condition and workpiece rotates at 60 rpm.



V. CALCULATION

A. Centrifugal force on rotating plate (Boring operation)

$FC= m.w^2.r$

$FC= 1.2(2\pi 60/60)^2(0.05)$

$FC= 2.368N\text{-}M$

Where, FC=Centrifugal force, m=mass of body, w=Angular velocity $w= (2\pi n/60)$, r= rotating around a point distance.

B. Cutting speed (VC)

$VC= (\pi D_c n) / 1000$

$VC= (\pi\ 6.5\ 2800) / 1000$

$VC= 57.176$ m/min.

Where, VC= Cutting speed, D_c = Drill diameter in mm, n= Main axis spindle speed.

C. Feed speed of the main spindle (v f)

$vf = Fr.n$

$vf= 0.004 . 2800$

$vf= 284.48$ mm/min.

Where, vf= Feed speed of the main spindle, Fr = feed per revolution.

D. Cutting time

$T_{m=} L/vf$

$T_{m=} 25/284.48$

$T_{m=} 0.087$ min

$T_{m=} 5.27$ sec

Where, $T_{m=}$ cutting time in sec, L= Depth of hole in mm.

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E. Material Removal Rate For Drilling Operation

MRR= ($\Pi D^2/4$) (vf)
MRR= ($\pi(6.5)^2/4$) (284.48)
MRR= 157.33mm^3/sec

F. Cutting Time For Boring M/C

T_m = L+A / fr N
$T_m = 25+ (\pi D_1^2 - \pi D_2^2 /4) / (0.005. 60)$
$T_m = 1 + (\pi 8^2 - \pi 6.5^2 /4) / (0.005. 60)$
T_m = 1.224 min
T_m = 73.44 sec

G. Material Removal Rate for Boring Operation

MRR = L ($\Pi D_1^2 - \Pi D_2^2$)/4 ÷ L/ fr.n
MRR = 25 ($\pi. 8^2 - \pi .6.5^2$)/4 ÷ 1/ (0.005 . 60)
MRR = 2.16 mm^3/sec.

VI. CONCLUSIONS

A. With the help of this machine we can do both drilling and boring operation together in single pass.
B. Desired depth of the hole can be obtained.
C. The size of machine is smaller than the older machine so it is very simple to move it from one place to another.
D. Machine can be easily transported. The overall space required is also minimize.
E. The efficiency of this machine is better than the older machine.
F. The machine is very simple to operate.
G. No need of skilled operator for the operation.

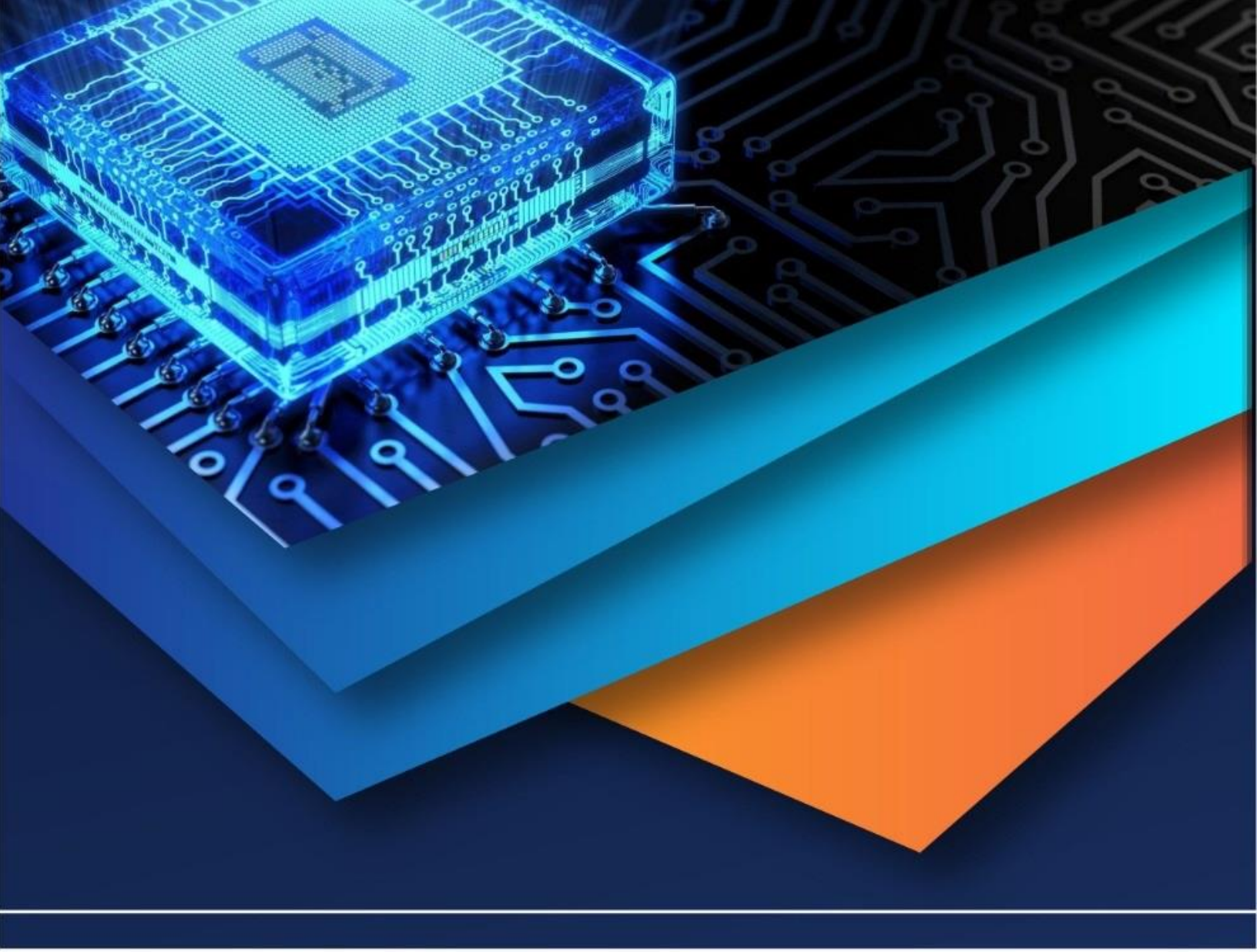
VII. ACKNOWLEDGMENT

Foremost, I would like to express my sincere gratitude to my guide Prof. Hardik Mehta for the continuous support of my Project study and research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research and writing of this report. I could not have imagined having a better advisor and mentor for my Project study. Besides my advisor, I would like to thank to Prof. Mitesh J Mungla, HOD, Mechanical Engineering department, who gives guidance for the Project work and their insistence for meeting deadlines we can do such excellent work. I offer my special gratitude to all the faculty members, Mechanical Engineering Department, Indus University for their help and support. I thank to my friends for providing me such a warm atmosphere to make my study more delightful and memorable. I would like to express endless gratitude to "My Parents" who gave me everything they could to enable me to reach the highest possible education level. I only hope that they know how their love, support and patience encouraged me to fulfill their dream. I would like to thank all people who have helped and inspired me during my Report study:-

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