

DESIGN AND MANUFACTURING OF SEMI-AUTOMATIC MULTI SPINDLE DRILLING ATTACHMENT ON LATHE

CHAVAN JAY SHRIDHAR¹, PARADE KUNDAN YUVRAJ², VADMARE KUNAL SHRIMANT³, SAYYAD NIHAL FAYAZ⁴, Prof.P.V.Jatti⁵

^{1,2,3,4}Student, of Mechanical Engineering, JSPM's Bhivarabai Sawant Institute Of Technology & Research Wagholi, Pune, Maharashtra

⁵Assistant Professor, Department of Mechanical Engineering, JSPM's Bhivarabai Sawant Institute Of Technology & Research Wagholi, Pune, Maharashtra

Abstract: The challenge of developing new machining industries and company is mainly focused on the achieving of best quality, time saving operation for increasing the of production, less removal of materials of cutting tools, hence rising the performance of the instrument. Now a day challenge of market, manufacturers and giving better performance are compelled to be more responsive to the customer's demands regarding more quality, specific quantity, minimum cost, and within time. Productivity can be increased by decreasing the overall machining time and combining the machining operations etc. The better direction to increase the production rate (productivity) along with quality and quantity is by use of special type of modifying lathe. The Productivity and performance of the available or existing drilling lathe will be increased by manufacturing, designing and Fabricating the newly type of Multiple Spindle Drilling Head. Multi-spindle drilling attachment, Productivity, Accuracy, Design, Construction and Manufacturing.

I. INTRODUCTION

Multiple-spindle drilling lathes are used for increasing the mass production rate and saving of important time which are required for producing the holes with help of drill, huge time minimise where large samples of products or jobs having number of holes are to be drilled. Multi-spindle head lathes are used in mechanical related factory in order to rising the productivity of machining processes. It is commonly used to drill holes for different pitch circle diameters. The centre distance between the spindles can be managed in any position as per the requirement of the various product. For keeping the centre distance between the drill spindles variable, they are connected to the main spindle by an Adjustable Transmission System (ATS). Now a day in market the customer requirement and demand the product should be in greater quality, right quantity, less cost, & at right time. Therefore, it is essential to improve productivity as well as quality of the jobs. The only way to achieve this is by using multi spindle drilling head. Designing of SPM is decided upon the principles of minimization of cost, improved productivity and high safety etc.

Drilling is the most generally perceived machining process whereby the operation incorporates making round openings in metallic and non-metallic materials. Around 75% of all metal-cutting method is of the drilling operation. Drills generally have a high length to diameter proportion that is fit for making significant hole, however as a result of its flexibility, vital security measure ought to be taken to keep up accuracy and keep drill from breaking.

Drilled holes can be either through holes or visually blind holes. A through holes is made when a drill leaves the inverse side of the work; in blind hole the drill does not leave the work piece. During the operation, chips that are created inside the work piece must exit through the flutes to the outside of the device. As the chip is formed and removed towards the surface, it will produce friction. Friction subsequently warm is likewise created when the drill bit touch the work piece during the hole making process. In this way, chip transfer and cutting fluids are among the most essential components should be consider during this procedure. Regularly, holes created by drilling are greater than the drill diameter and relying upon its applications; the drilled holes will subjected to different operations, for example, reaming or sharpening to better surface complete and dimensional exactness.

II. LITERATURE SURVEY

Prof. Shingavi ,Prof. Dongare In the present chapter the contribution made by different researchers and authors in the field of manufacturing were enlist in short. It includes the methods, mathematical modeling, different input parameters as well as their output result. finally the summery of literature review as: Prof. Udgave et.al. explain the importance of radial drilling lathe and special purpose lathe . He also compares the advantage and disadvantage of both. The growth of Indian manufacturing sector depends largely on its productivity & quality. Productivity depends upon manufacturing efficiency with which the operation/activities are carried out in the organization. The best way to improve the production rate along with quality is by use of special purpose lathe. This paper deals with design and development of multi spindle drilling head for cycle time optimization of the component. [1]

Prof. Shingavi et.al. stated that the challenge of modern machining industries is mainly focused on the achievement of high quality, in terms of high production, less wear of cutting tools, economy of machining by considering cost saving and increase the performance of the product. Productivity can be improved by reducing the total machining time, combining the operations Productivity and IJTSRD31049 International Journal of Trend in Scientific Research and Development . [2]

Prof. Nargatti et.al. explain the importance of productivity. If we reduce total machining time, Productivity can be improved. In case of mass production where variety of jobs is less and quantity to be produced is huge, it is very essential to produce the job at a faster rate. The best way to improve the production rate (productivity) along with quality is by use of special purpose lathe. If we design twin spindle drilling head, then it is possible to increase the performance of radial drilling lathe.

Prof. Chukwumuanya- investigated Design and developed multiple spindle drilling head for mass production of Peugeot 504 automobiles brake drum. For this design they developed multi-spindle drilling head for drilling six holes at a time, in which four holes of $\varnothing 14.5\text{mm}$ and two holes of $\varnothing 8.5\text{mm}$. They analysis the various gear forces theoretically. It concludes that mash increases production rate as compare to individual drilling operation.

Prof. M.B. Bankar- Studied Improvement in design and manufacturing of multiple spindle drilling attachment, in which they used planetary gear system for drilling operations. In this case study we briefly give information about design of drilling attachment for motor selection to its gear box. This study concludes that Multi spindle drilling attachment increase productivity reduces cycle of operation and performs drilling operation more accurately.

S. R. Gawande, S. P. Trikal studied on “Design of Special Purpose Multi Spindle Drilling Lathe”. This paper discusses the study of design of multi spindle drilling lathe. In case of mass production where variety of jobs is less and quantity to be produced is large, it is very essential to produce the job at a faster rate. This is not possible if we carry out the production by using general purpose lathes. The best way to improve the productivity along with quality is by designing special purpose lathe. The multiple spindle drilling attachment performs basic drilling operations; there are some specific functions that are performed more accurately. This attachment works mainly on planetary gear system arrangement.

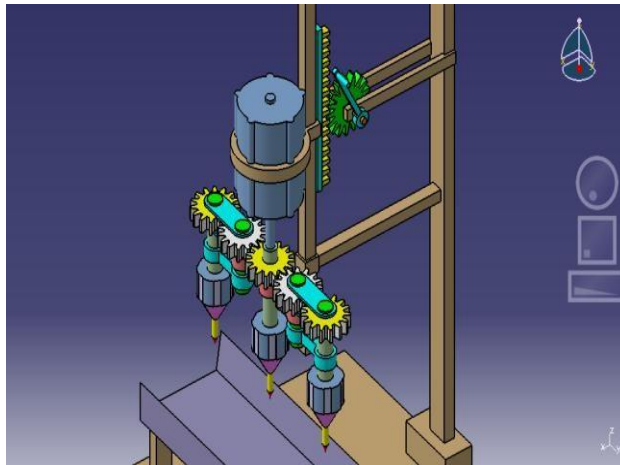
B. B. Kuchhadiya, H. G. Chothani, J. R. Solanki studied on “Selection of Material for bearing using MADM Approach”. This paper discusses about various methods to be used for selection of bearings. The methods used for selection of bearings are The AHP Approach, the simple additive weighting (saw) method, weighted product method (wpm).

III. METHODOLOGY

Proposed work started with the problem identification in industrial process of manufacturing of different type of saddle clamp. By collecting available information and specification further solution finding approached. It is found that Quality and productivity play important role in today’s manufacturing market Multi-spindle drilling head is the cheapest and most efficient way to improve the productivity . A Multi spindle drilling lathe will drill a number of parallel holes simultaneously in a work piece. Multi spindle drilling lathes are employed for work of a light character, especially repetition work, such as drilling small components for the Automobile and Aircraft industries. A Multi spindle drilling lathe has a number of drill spindles driven by a single motor. All the spindle sholding the drills are fed in to the work piece at the same time. For this purpose, either the drill heads can be lowered onto the work piece or the work table is raised. The Main eccentric is driven by the drilling lathe spindle which is driven by a single motor. The several drill holding eccentrics are driven by the main Eccentric through a Revolving plate. Eccentric is a mechanism which is usually used to convert rotary motion into sliding motion. It shall be noted that an Eccentric cannot convert reciprocating motion

into rotary motion. Here we are converting the rotary motion into revolutionary motion and in to rotary motion. when the main spindle rotates, the rotary motion of the spindle is converted into revolutionary motion of the Revolving plate. Through the Main Eccentric and the revolutionary motion of the Revolving plate is converted into rotary motion of the Drill holding Eccentrics. The conversion of the motion is achieved by the ECCENTRICITY provided in the eccentrics. Drill bits can be fed by lowering the Drill head. The pillars provided with springs guide the Driller head in motion. Springs secure the Drill head with drill bits, from a rapid fall, while releasing the Drill head from the lathe spindle. It is designed to drill five holes of various diameters in unsymmetrical layouts. The art of ECCENTRICITY plays a major role in this principle.

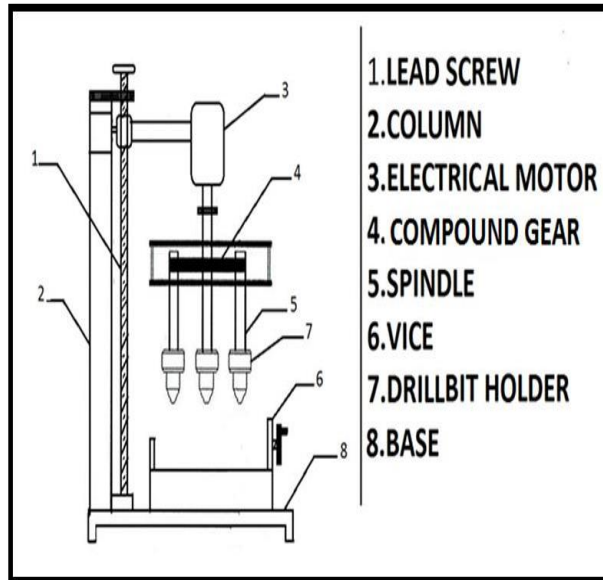
BASIC PRINCIPLES OF MULTI-SPINDLE DRILLING:



- As the name demonstrates various multiple drilling machines have two spindles driven by a solitary power head and these two spindles holding the drill bits are fed into the work piece simultaneously.
- The spindles are so constructed that their centre distance can be balanced in any position within the drill head depending upon the job requirement. For this reason Allen Bolt is used.
- The power from the motor is transmitted by spindle to the centre gear. After the power at centre gear is transmitted to the drilling spindle by compound gear.

Design parts Parts to be purchased:

For design parts detail design is done and dimensions thus obtained are compared to next highest dimension which are readily available in market this simplifies the assembly as well as post production servicing work. The various tolerances on work pieces are specified in the manufacturing drawings. The process charts are prepared & passed on to the manufacturing stage. The parts to be purchased directly are specified & selected from standard catalogues. In system design we mainly concentrate on the following parameter such as System selection based on physical constraints, Arrangement of various components, Components of system, Chances of failure, Servicing facility, Height of m/c from ground, Weight of machine.



IV. SYSTEM DESIGN

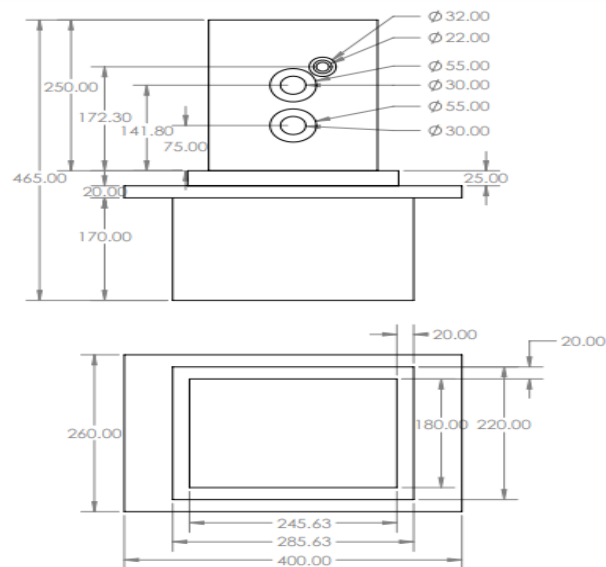
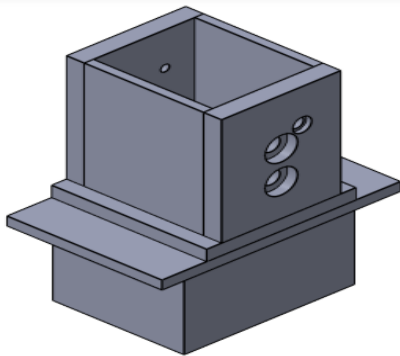


Fig. SPINDLE HOUSING

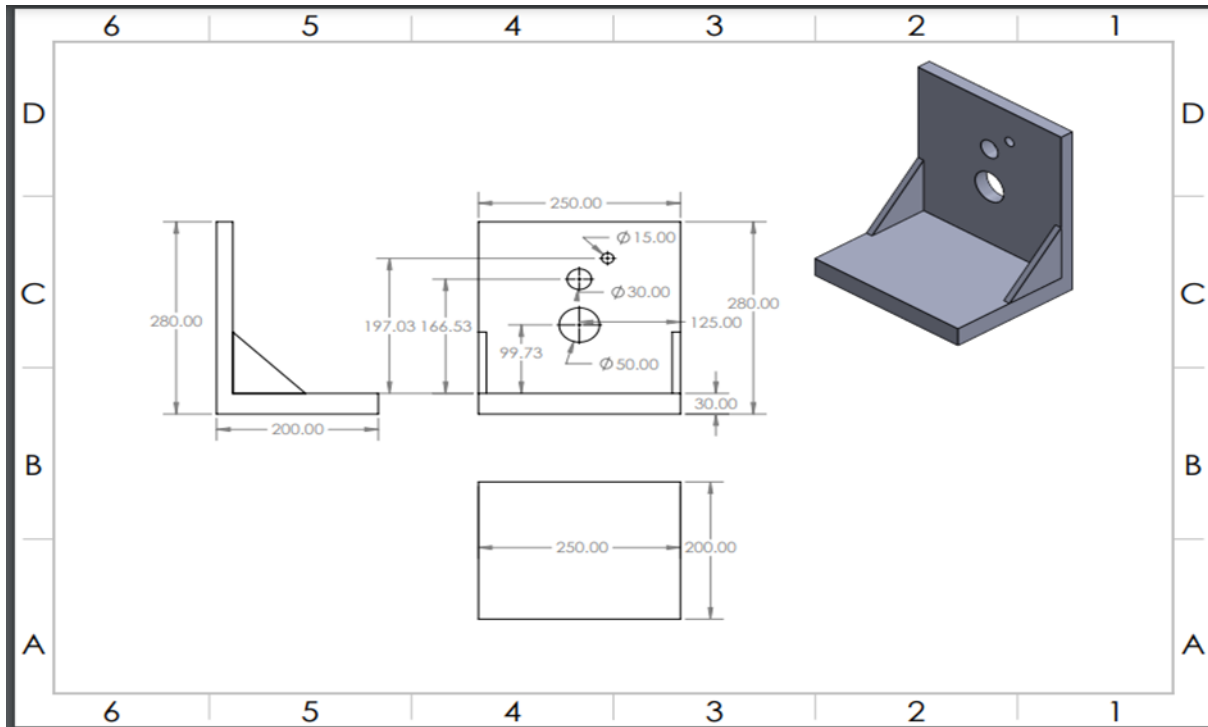


Fig. JIG FIXTURE DESIGN

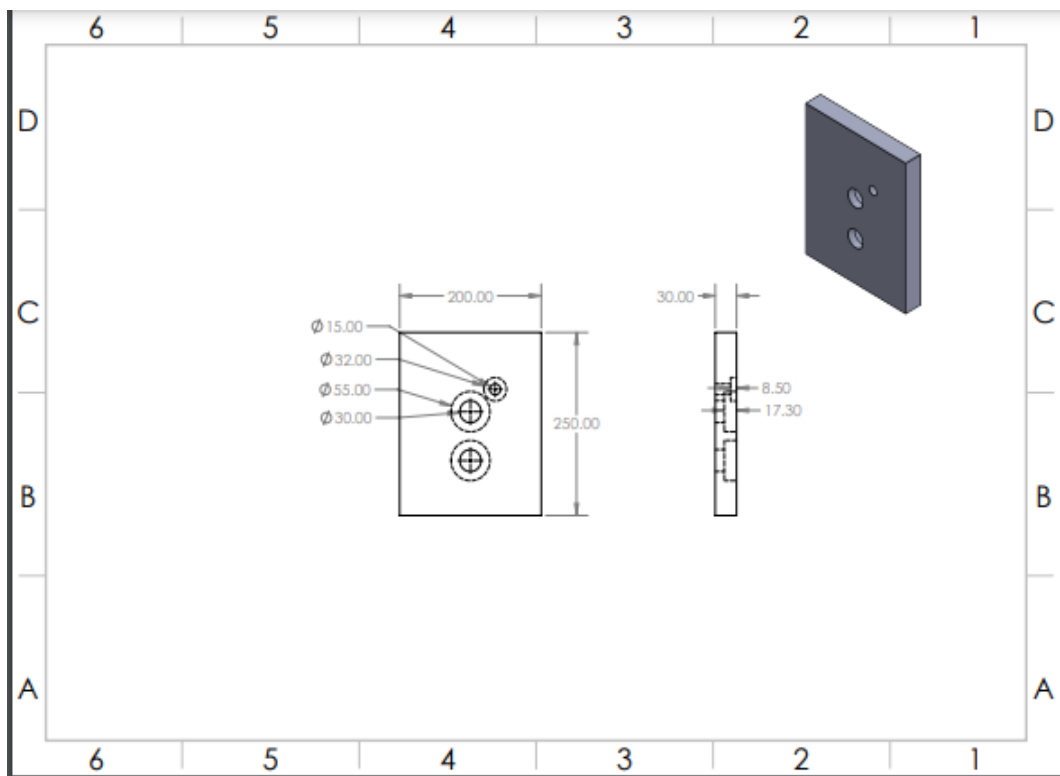
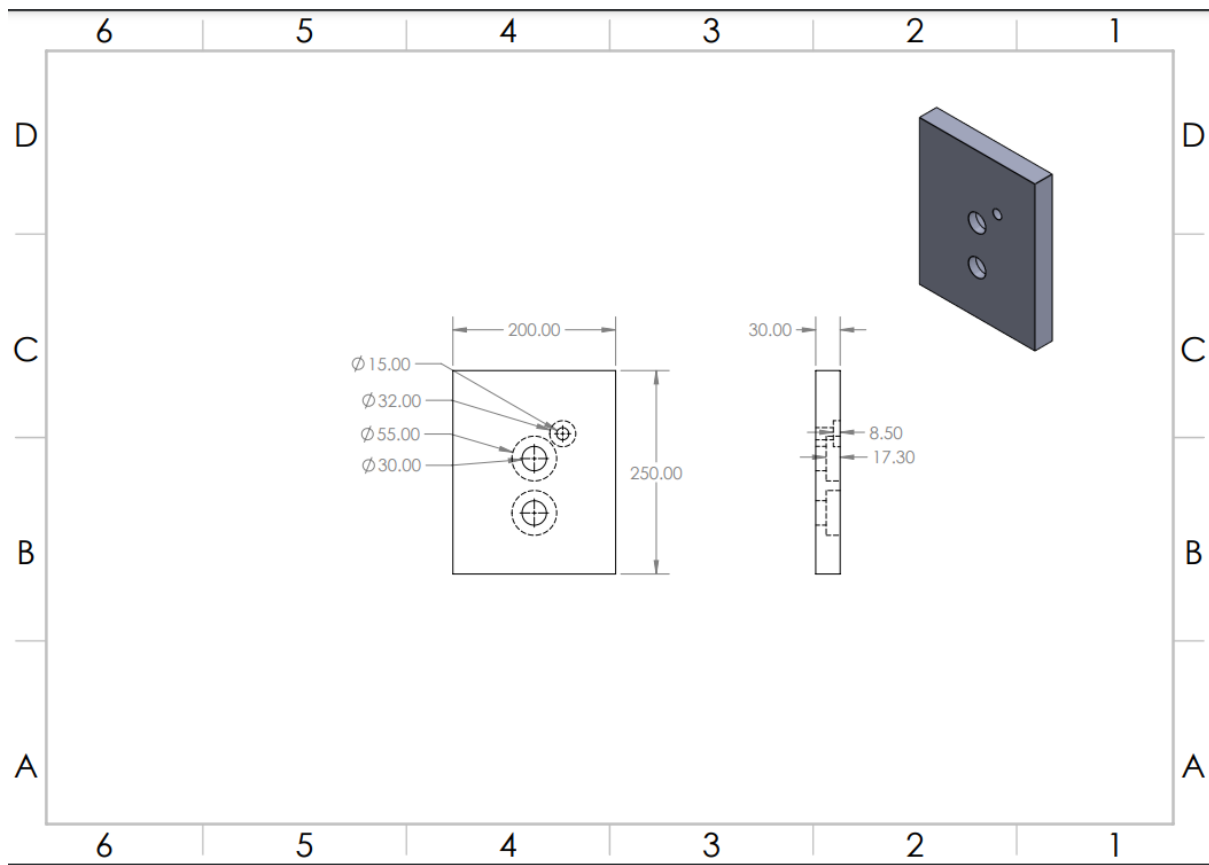


Fig. JOB WORK

**Fig. Job Profile**

V. CONCLUSION & FUTURE WORK

Conclusion:

By using Multi-Spindle drilling head productivity will be increased. Multiple holes can be drilled at a time. Multi-Spindle drilling head will reduce the operation cost. Multi drilling operation takes place in one cycle so holes will not be skipped. This Attachment is beneficial for mass production. The twin spindle drilling attachment can be effectively used in conjunction with the vertical drilling machine and can be operated at different speeds that are suitable for drilling. The attachment is portable which gives it an advantage of using it anywhere. It presents an added advantage of being inexpensive over the CNC machining option. Time saving is obtained by a combination of two operations, which also provides with an added benefit of reduced operator fatigue. This setup can help manufacturers reduce cycles of operation and thus increase productivity. Also the attachment enables machining of through holes in workpiece of defined dimensions efficiently, thus it is very useful in mass production.

REFERENCES

- 1) Prof. P.R. Sawant, Mr. R. A. Barawade, Design and development of SPM-A case study in multi drilling and tapping machine. E- ISSN2249-8974, IJAERS/Vol.I/IssueII/January March, 2012/5557.
- 2) Prof. P.R. Sawant, Mr. R.A. Barawade January-March, 2012, Design and development of SPM – A case study in multi drilling and tapping machine, IJAERS, Vol. I, E-ISSN-2249 8974.
- 3) Manish Kale, D. A. Mahajan, Dr.S. Y. Gajjal, A review paper on development of spm for drilling and riveting operation, International Journal of Emerging Technology and Advanced Engineering Volume 5, Issue 4, April 2015.
- 4) A.M. Takale, V. R. Naik; January-April 2012, Design & manufacturing of multi spindle drilling head (msdh) for its cycle time optimization, International journal of Mechanical Engineering applications research, Vol 03 ISSN: 2249-6564.

- 5) A.S. Aditya Polapragada, K. Sri Varsha, September 2012, Pneumatic Auto Feed Punching and Riveting Machine, International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181, Vol. 1 Issue 7.
- 6) P.O. Bouchard, T. Laurenta, L. Tollier, August 2008, Numerical modeling of Self-Pierce riveting from riveting Process modeling down to structural analysis , Journal of materials processing technology, Velizy – Villacoublay, France.Kaushar H. Barad , Muksh . Balsara, Giriraj J. Patel, and Saurin
- 7) M. Sheth Automation Of Conventional Radial Drilling Machine National conference on Innovations in Mechatronics Engineering (IME-09) 13-14 March, 2009.
- 8) Prof. M.B. Bankar, Prof. P.B. Kadam, Prof. M.R. Todkar, Improvement in design & manufacturing process of multiple spindle drilling attachment, IOSR Journal of Engineering, Volume 3, Issue 1, Jan 2013, 38-43.
- 9) Pratik Parsania, Prof. Jignesh Dave and Brijesh Garala, Design of hydraulic power pack for SPM (Multi Spindle Drilling), Indian journal of applied research, Volume 3, Issue 6, ISSN- 2249- 555X , June 2013.
- 10) Bajirao H. Nangare Patil, and Prof. P. R. Sawant, Design and Development of Gearbox for Multi Spindle Drilling Machine (SPM), International journal of engineering research & technology (IJERT) Volume 2, Issue 5, ISSN: 2278-0181, May- 2013.
- 11) Nikhil J Surwade, Vinay K Thute Design and Development of a Special Purpose Machine for Combined Trimming and Drilling Operations on Tail Lamp Bracket Casting of a Motor Cycle International Journal of Innovative and Emerging Research in Engineering Volume 2, Special Issue 1 MEPCON 2015
- 12) Chukwumuanya, Emmanuel O, Obuka, Nnaemeka Sylvester P, Onyechi, Pius C, and Okpala Charles*, Theoretical design and analysis of a semi-automatic multiple-spindle drilling head (msdh) for mass production processes in developing countries, International journal of engineering and innovative technology (IJEIT) Volume 2, Issue 5, November 2012, 260-266.
- 13) Prof. Ms. A.A. Shingavi, Dr. A.D. Dongare, Prof. S.N. Nimbalkar Design of Multiple Spindle Drilling Machine International Journal of Research in Advent Technology (EISSN: 2321-9637) ICATEST 2015, 08 March 2015.
- 14) Yaman Patel, Nikalas Bhandakkar, Prashant Wangarwar, Pranay Thakre, Sagar Awachat, Ms. Manisha Fande Design and Fabrication Multi Spindle Drilling Machine with Different Pitch Hole March 2018.