NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY
[IJIERT] ISSN: 2394-3696 Website: ijiert.org
VOLUME 8, ISSUE 8, Aug. -2021

A REVIEW PAPER ON WORK HOLDING DEVICES FOR DRILLING OPERATIONS

Mr. Raghavendra Ingale
M. Tech, Research Scholar, Mechanical Engg. Dept. / VVPIET Solapur/
N. Dr. Babasaheb Ambedkar Technological University, Lonere

Prof. U. M. Rawat
Ass. Prof and HoD Mechanical Engg. Dept./ VVPIET Solapur/
Dr. Babasaheb Ambedkar Technological University, Lonere

ABSTRACT
One of the important tool to improve productivity is to reduce set up cost on the shop floor. The research review presented here deals with the productivity improvement with the help of new types of work holding devices particularly for drilling operation. Various research works has been examined dealing with jigs and fixture design, ranging from optimization methods used to design, Efficacy of the Software tools used for design, Special purpose machine design etc. The review will not only helpful for the current research work but also will be instrumental for further researches in the field.

INTRODUCTION
The manufacturing business enterprise targets on the dimensional quality of the work-piece as well as surface finish, improving the working of machined parts. The procedure of design for the fixture and modification in the present fixture is complex and spontaneous process, that requires an extended education and cognition of the fixtures. A necessary design circumstance within the design procedure of work-holding device is to draw the design of fixtures.
In an average workstation, number of machining processes viz. Milling, turning, boring, shaping, drilling etc. are performed on the work-piece. These processes are either to create the new part from a raw material block or to manufacture the existent part. The holding devices plays an important role in stipulating the proper steadiness to work-piece without distorting and deteriorating the surface roughness of the work piece, also reduces the holding or and unholding time of the work piece.

LITERATURE REVIEW
Nand Mangukia et al observed that more cycle time diminishing Product quality more Labor fatigue. They proposed the usage of 3-2-1 principle modeling software and subsequently in fabrication. They used time study and cost study and found that the total time of production as well as cost will cut down after using fixture. They claim that they have achieved reduction of 45.03% of cost later using the fixture.

Tushar B. Malode et al, suggested that the improvement in production rate along with quality of product by using some special purpose machines. Utility and execution of the present radial and Multi-spindle machine will be enhanced by designing and manufacturing of Multi-spindle head attachment. They dealt with design and improvement of Multi-spindle head for cycle time optimization of component.

Pranesh Mohan Mishra et al, proposed a 360 ^{o} flexible drill machine that can be affixed on a table and can be utilized to drill holes horizontally or vertically or even for upside down. That made it achievable for effortless drilling in even complex parts and surfaces. Since number of operations & holes can be drilled in a simple unit. It is time saving and economical. Considering its usage and expenditure of project, it gets on relatively inexpensive when compared to another unit.

N.U. Kakade et al, our attempt is small in the whole of the Engineering world, but it can do better than any other machine for the same purpose with less cost. This design is simple and compact in size. Therefore, it is affordable by the small scale industries This is done by reducing the set up cost and manual fatigue. Trial

and error method is usually practiced until the axis of the hole is properly aligned with the axis of the drill. In such a situation a lot of time is being wasted to maintain the accuracy.

Hemanth M et al, have designed and manufactured the work holding device for a wheel hub of a car and also provided a elaborate study of process taken over to reach the concluding design of this work holding fixture. Their primary objective was to ensure the fine placement of the component, that assist in rising the quality of the production and trim down the scrap rate. Since the whole design being cautiously examined beforehand, the manufacturing process is disciplined intimately, and design attribute are proved effectual within the execution obligation.

Tejas V. Kadam et al, proposed square drilling attachment. The proposed mechanism works on the rule of REULEAUX TRIANGLE. The attribute of REULEAUX TRIANGLE is that, as this triangle revolve in a square, its corners will travel a path on a square with rounded corners The project is primary in modification and reduced in measure for utilization.

Vivek .M, Sundarajan et al, they have replaced jigs to preserve the time for loading- unloading of the component. A jig furnishes the manufacturer for adaptability in holding forces and optimizes the designing for machine procedure as well as process purpose ability.

Djordje Vukelic et al presented an inherent grouping for machining fixture layout designing and improvement. The optimization faculty of this system allows uncovering of optimum emplacement of locating and clamping of the elements, which render required quality, at the same time pledges design of the collision-free fixtures.

Sampath Kumar designed and implemented a new kind of fixture such that the amount of parts machined per day improved by 32% with anticipated savings of more than €6000 per year. With an added advantage of a modular jig system means it could be used in machining assorted products.

Musa Alhaji Ibrahima et al shown that software tool such as Pro/E and Wildfire 4.0 and the Master CAM have the capability to modify manufacturing dealing thus allowing the manufacturing flexibleness, reacting to consumers' needs and demands, rising the products' quality, reducing the cost of production and decreasing product evolution cycle.

Yousef M. Abueejela et al, designed and fabricated an machine-controlled drilling machine settled on PLC to create holes (8mm depth) in the middle of a cubic work pieces (3 cm ×2 cm × 3cm). And they were successful in doing so.

Shah Sajan R et al, has found that with the use of magnetic vice flexibility improved, set up time reduced, also shifting of job on a regular basis by fixture also increase accuracy. Hence they recommend the use of magnetic vice in the drilling machine to reduce the time of clamping, and lifting job.

Mohsin lalabhai Shaikh et al, proposed a method to design & fabricate the useful Jig and Fixture, for component needed to trim down the manufacturing cycle time. When the component manufactured on a little size, antecedently this is to produce the ample amount of requirements. The discriminating components requires for machining dealing such as step milling, angle milling & boring and reaming etc.

Doli Rani et al, designed and developed a movable work platform over-headed by 2 hydraulic cylinders they found that it meets the needed design standards. Also It was found that it can lift hefty loads upto 1.5 – 2 tons.

Charles Okpala et al has advocated that jigs & fixtures essentially be supplied with competent clearance that should permit for random variations in size of the components particularly during the forging, casting

and milling operations they have also showed that since the design of the jigs & fixtures is interdependent on many factors that are analyzed to accomplish an optimal output and they should be made of stiff light materials to alleviate easy manipulation.

Joyson Sam et al, designed a drill jig that helped to modify the activity and cut back the risk of the manipulator during the loading-unloading. They say that substitution of skilled person also proves cost efficacious in the process. It drills holes on components with dead-on alignment and therefore loss of rejections will be decreased. It also defends the surface of the work piece from the scratches and damages etc.

Observations

The literature review carried out above has provided a pathway for identification and selection of problem. Also it helped to create hypothesis of the research work to be carried out.

Experimental Details

Experimentation could be carried out for this research work by using various methods to record the input and output parameters array settings can be used, For the analysis and to study response variable regression methods, signal to noise ratio, and Annova methods could be used. However, the research work is limited to designing part of the work holding device and the experimentation can be done by the researchers by taking reference of this work.

Research Methodology

Step 1: Selection of appropriate method of design
Step 2: Design Calculations
Step 3: 3D Modeling in appropriate software
Step 4: Results and discussions
Step 5: Future prospectus of research discussion

Objectives

The main aim is to locate, hold and support the work securely so that the required machining operations can be performed.

1. To design a work holding device through optimization.
2. To design device with enough rigidity and robustness to prevent vibration else it may lead to undesired movement of the workpiece and tools.
3. To restrict movement of the workpiece i.e. there is zero degree of freedom of the workpiece after clamping the workpiece.

CONCLUSION

From review it is concluded that various design considerations are to be fulfilled to design a new work holding device for the drilling operations. Also it is evident that very less amount of research has been conducted in the specified area.

REFERENCES

1) Design and Development of Fixture for Pillar Drilling Machine Nand Mangukia1, Nandish Mangukia2, Meet Rachhadia3 , Ayanesh Joshi4 International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887 Volume 5 Issue XI November 2017
2) Design and Fabrication of Multi-Spindle Machine Tushar B. Malode Prof. R. R. Gandhe IJIRST – International Journal for Innovative Research in Science & Technology| Volume 3 | Issue 02 | July 2016 ISSN (online): 2349-6010

3) Design & Fabrication of 360° Flexible Drilling Machine Lookesh Kumar Sahu1 Pranesh Mohan Mishra2 Deepak Kumar Singh3 Vijay Kumar Yadu4 Sandeep Kumar Kansari5 IJSRD - International Journal for Scientific Research & Development| Vol. 6, Issue 02, 2018 | ISSN (online): 2321-0613
4) Fabrication of Combine Drilling and Tapping Machine N.U. Kakade1, Piyush Bhake2, Sumit Dandekar2, Rohan Kolte2, Sumit Selokar2 International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 04 Issue: 03 | Mar -2017 www.irjet.net p-ISSN: 2395-0072
5) Design of work holding device for machining wheel hubs Hemanth M, P R Dheeraj, Hamritha S, Rajesh B and Vamshi Krishna S R First International Conference on Advances in Physical Sciences and Materials Journal of Physics: Conference Series **1706** (2020) 012204 IOP Publishing doi:10.1088/1742-6596/1706/1/012204
6) Square Drilling Attachment for Lathe Machine Mr. Tejas V. Kadam1, Mr. Rohit S. Yadav2, Mr. Swapnil D. Gaikwad3, Mr. Vikas P. Patil International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 12 | Dec-2017 www.irjet.net p-ISSN: 2395-0072
7) A Review on Work Holding Device of Jig Vivek .M, Sundarajan .V, Mohan .P, International Journal of Advance Research and Development. © 2017, www.IJARND.com All Rights Reserved
8) Djordje Vukelic, Goran Simunovic, Branko Tadic, Borut Buchmeister, Tomislav Saric, Nenad Simeunovic Intelligent Design And Optimization Of Machining Fixtures Issn 1330-3651 (Print), ISSN 1848-6339 (Online) DOI: 10.17559/TV-20150908142130
9) Sampath Kumar Senthil Kumar, Continuous Improvement Of a Machining Process By Designing a New Jig 2018 Isep – School Of Engineering, Polytechnic Of Porto Mechanical Engineering – Masters In Industrial Management
10) Musa Alhaji Ibrahima,*, Huang Kaib & Mustapha Mukhtar Usman Application of CAD/CAM in the Design of Machining Process and Tooling Devices for Flange Tube Jurnal Kejuruteraan 32(1) 2020: 17-23 https://doi.org/10.17576/jkukm-2020-32(1)-03
11) Yousef M. Abueejela , A. Albagul , Ibrahim A. Mansour and Obida M. Abdallah Automated Drilling Machine Based on PLC IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 3, March 2015. www.ijiset.com ISSN 2348 – 7968
12) Shah Sajan R, Rakesh prajapati, Deepjyoti Basak Development and Optimization of Magnetic Vice in Drilling Machine JETIR1904716 Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org
13) Mohsin lalabhai Shaikh, Dr. Abhang L.B. Vishwabharati Academy's Collage of Engineering Design Development of Multipurpose Jig & Fixture of Injection Moulding Die. Publication Since 2012 | ISSN: 2321-9939 | ©IJEDR 2020 Year 2020, Volume 8, Issue 3
14) Doli Rani Nitin Agarwal Vineet Tirth Design and Fabrication of Hydraulic Scissor Lift MIT International Journal of Mechanical Engineering, Vol. 5, No. 2, August 2015, pp. 81-87 ISSN 2230-7680 © MIT Publications
15) Charles Chikwendu Okpala, Ezeanyim Okechukwu C. Department of Industrial/Production Engineering, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria The Design and Need for Jigs and Fixtures in Manufacturing Science Research 2015; 3(4): 213-219 Published online July 25, 2015 (http://www.sciencepublishinggroup.com/j/sr) doi: 10.11648/j.sr.20150304.19 ISSN: 2329-0935 (Print); ISSN: 2329-0927 (Online)
16) Joyson Sam Devapaul P Design and Fabrication of a Drill Jig for Circular Disc Brake Using Sliding Tray Mechanism International Journal of Innovative Research in Science, Engineering and Technology (A High Impact Factor, Monthly, Peer Reviewed Journal) Visit: www.ijirset.com Vol. 7, Issue 11, November 2018.